Asian Bulletin of Energy Economics and Technology
Vol. 4, No. 1, 10-21, 2016
ISSN(E) 2313-819X / ISSN(P) 2518-0142
DOI: 10.20448/journal.507.2018.41.10.21

Indirect Regulatory Capture, Regulator and the Utility in Electricity Sector

J. G. L. S. Jayawardena[1]
U. Anura Kumara[2]
M. A. K. Sriyalatha[3]

[1,2,3]*University of Sri Jayewardenepura, Sri Lanka*
[1]*Email: suljayawa@yahoo.com Tel: +94719994133*
[2]*Email: deanfmsc@sjp.ac.lk Tel: +94718483000*
[3]*Email: kumuduni@sjp.ac.lk Tel: +94718498315*

(✉ Corresponding Author)

Abstract

This paper discussed the two cases of the regulatory decisions of the electricity sector regulator of Sri Lanka on renewable energy tariff calculation and approval of long term generation Expansion plan. The objectives of the analysis of the case studies are to examine how does utility can react on the regulatory decisions in the monopolistic market and whether it leads to a situation of Indirect Regulatory Capture. The regulatory process is examined from the perspective of various interest groups over the time, using Public Interest theory and Interest Group theory. The two cases are shown to have been strongly influenced by the interests of the different stakeholders of the electricity sector themselves, indicating a degree of 'regulatory capture'. The relationship of the utility and the regulator has been increasingly challenged by external pressures, interests of the stakeholders, and by, the level of resistance of the monopolistic utility. The paper concludes that in the monopolistic electricity market regulators decision can be reversed if the Utility is strong enough to resist the regulators decision if not favorable for the public or the utilities' interest.

Keywords: Sector regulation, Regulatory capture, Public interest theory, Interest group theory, Ceylon electricity board, public utilities commission, Renewable energy generation.
JEL Classification: D42.

Citation | J. G. L. S. Jayawardena; U. Anura Kumara; M. A. K. Sriyalatha (2016). Indirect Regulatory Capture, Regulator and the Utility in Electricity Sector. Asian Bulletin of Energy Economics and Technology, 4(1): 10-21.
History:
Received: 30 August 2018
Revised: 2 October 2018
Accepted: 7 November 2018
Published: 4 December 2018

Publisher: Asian Online Journal Publishing Group

Contribution/Acknowledgement: All authors contributed to the conception and design of the study.
Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no conflict of interests.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study was reported; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained.
Ethical: This study follows all ethical practices during writing.

Contents

1. Introduction

Public Utilities Commission of Sri Lanka (PUCSL) was established by the enactment of Act No. 35 of 2002. In 2009 with the introduction of Sri Lanka Electricity Act No.20 of 2009, electricity sector was brought under the regulatory mechanism while giving PUCSL the regulatory mandate. One of the key aspect of the regulatory mechanism for the electricity sector is to protect the public interest in particular, with the contribution to a socially equitable and environmentally sustainable provision of electricity services (Byrne and Govindarajalu, 1997). In any regulatory regime, measures have been taken to protect the independence of the regulator in order to prevent regulatory capture. Independent regulatory agencies are important for good governance (Dubash, 2008). Regulatory good governance is important for the regulatory process if those are implemented practically (Cubbin and Stern, 2006). Schwartz (2007) emphasized that regulation is essential to protect physical health, safety, security, and finances and in order to deliver the public service to general public properly, efficiently, and effectively. In Sri Lankan context Utility in discussion, the Ceylon Electricity Board is responsible for part of the electricity generation, electricity transmission and 90% of the electricity distribution. The balance 10% of electricity distribution comes under the Lanka Electricity Company(LECO). There are few Independent Power Producers(IPP) including renewable energy projects coming under the Standard Power Purchase Agreements.

Regulatory capture is where the regulator favors the interests of one group of stakeholders over those of other groups (Mullins, 1997) and it increases the vulnerability of the regulator (Carter and Morgan, 2017). According to Adams *et al.* (2007) regulatory capture has been noted as one of the risks in the regulatory process. If the regulatory capture is there that will cause damage to the concept of regulation and violates the trust of the general public as well and other stakeholders on regulation. Phillips (1993) discussed that the regulator is usually subjected to improper external pressures. In sectors like electricity there are number of stakeholders, among those some of the stakeholders can apply improper pressures or influences towards regulator to achieve their desired objectives. The form of the influence varies and depends on particular group's objectives and intentions. Citizens of the country expect the sector to perform according to the public policies. Hence the transparency, accountability and fairness are the pillars of the citizens' expectations on regulatory process. Therefore, regulator has a huge responsibility to regulate monopolistic utility considering the interest of the public. According to Francis (1993 Cited by Mullins (1997)) there are three theoretical general frameworks to explain the regulation as, public choice models, public interest and interest group theory. We use Public Interest theory and Interest Group theory to explain the PUCSL decisions on Calculation of Feed in Tariff (FIT) for renewable energy purchase and approval of Long-Term Generation Expansion plan of CEB.

The most common form of regulatory capture occurs when a regulator make a decision based on perspective of one stakeholder. This is because that group is better informed, allowing it to be more influential in its arguments, and is in more frequent contact with the regulator, allowing it more opportunities to make its arguments. A particular group may also have more opportunities to meet up with the regulator informally, increasing its ability to influence them, or be able to offer employment and other opportunities to staff of the regulator. In that context regulation applies for the benefit of the regulated entities as opposed to the public interest (Carpenter and Moss, 2013). Engstrom (2012) has explained the types of regulatory capture specifically from a legal point of view as strong and weak capture. Accordingly, in the strong regulatory capture situation the interest-group influence is so pervasive and impact has high social cost where unlike in weak capture. The influential party of the case on calculation of FIT would be renewable energy developers and in the case of Long-term Generation Expansion plan it is not very much clear who is/are the influential stakeholder(s).

2. Objectives of the Study

The first study objective is to explain two cases on Renewable energy purchasing tariff calculation and approval of Long Term Generation plan using Public Interest Theory and Interest Group Theory. The second objective is to understand the impacts of regulatory capture to determine if there is regulatory capture and what is the impact on the public interest and whether the Utility can protect the interest of public. Further this paper analyses the indirect regulatory capture of the utility in a monopolistic market where utility does not implement regulators decision if it is not favorable for the utility and their framework.

3. Theories Used to Analyze the Cases

3.1. Public Interest Theory

Public interest theory emphasizes that under any regulatory mechanism the public interest has to be protected (Hantke-Domas, 2003). Hantke-Domas explains that the Chicago theory suggest that under any regulation that does not protect public interest and protect interest of interest groups (2003). Corry *et al.* (1994) discussed about the regulation and stakeholders' interest and also the government should look after the interest of public in regulatory regime. Public Interest theory argues that regulation aims to benefit "the public interest" (Crew and Rowley, 1988). If the regulator makes balance decision the public will get the benefits.

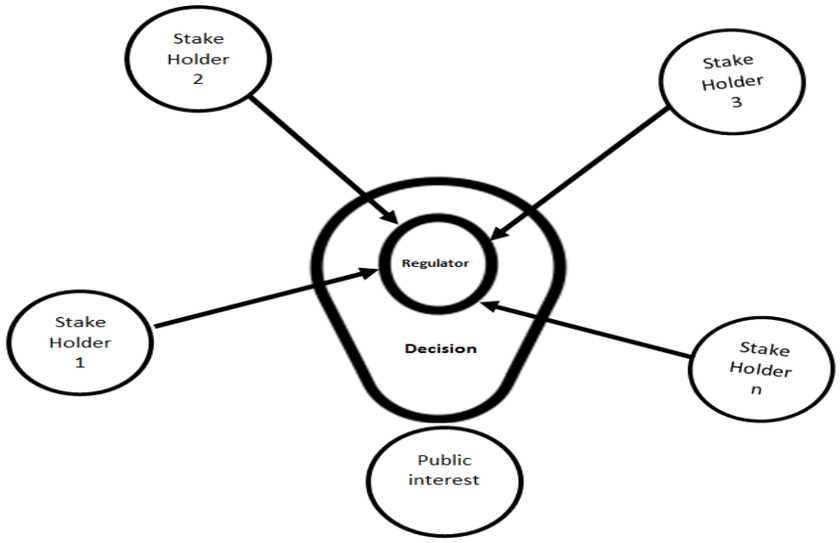

Figure-3.1. Balanced Regulatory decision

3.2. Interest Group Theory

Elhauge (1991) argues that all the participants in a process act to their self-interest. All the stakeholders involving with the process try to look after their interests in the process rather than the interest of general public. Any stakeholder group seek to maximize their own well-being at the process. In regulatory process groups who involve with the process try to maximize their benefits. Elhauge (1991) further discussed about the less focuses on public interest during the regulatory process as stakeholders do not look after the public interest. According to Francis (1993 cited Mullins (1997)) regulation is an exercise among groups and between groups and the state and such groups help to create regulatory initiatives and create regulatory outcome. In the electricity regulatory mechanism, there are lot of stakeholders such as employees of the utility, some of the independent power producers, government, regulatory employees. It is clear that such stakeholders can provide inputs which are favorable to regulatory process, where they can look after own interest of the group or individual. Macey (1986) explained that due to the interest group theory the major implication is legislation transfers of wealth from society to those discrete, well-organized groups that reduce societal wealth and economic efficiency in order to benefit these economic groups.

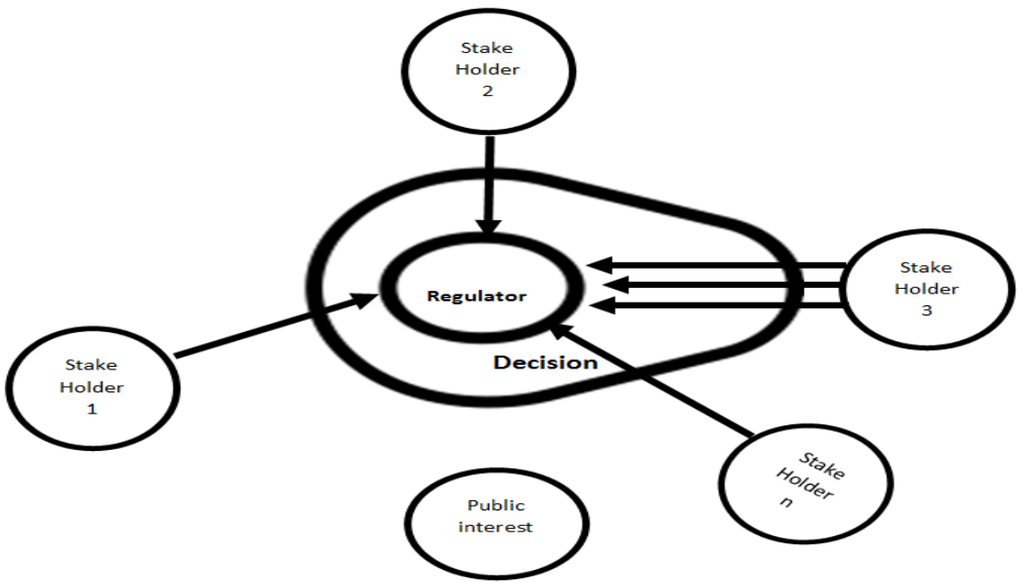

Figure-3.2. Bias regulatory Decision/Regulatory Capture

4. Methodology

Data for two case study was based on review of documents available with the regulator (PUCSL), Utility(CEB) and the Ministry of Power & Renewable Energy of Sri Lanka(MOPRE). Secondary sources of documents included, the research literature on various elements of the regulatory Capture, the policy and legislative response of government, as evidenced in government and institutional (PUCSL & CEB) documentation and the policy and decisions observable from the public records of PUCSL. These documents were analyzed with respect to the FIT calculation and approval of Long Term Generation Expansion plan and the main points of which are summarized below under each case.

5. Analysis of the Cases

5.1. Tariff Setting for Renewable Energy Purchasing from Independent Power Producers Under the Standardized Power Purchase Agreements

Tariff setting is an important aspect of power purchasing regulation. As per the section 9 of Sri Lanka Electricity Act No.20 of 2009 power purchase has to be done through competitive process. However, that process

was different for renewable energy generation especially generation less than 10 MW of projects. Ceylon Electricity Board (CEB) uses Technology Specific Cost based tariff for renewable energy electricity purchasing as the FIT. According to Lesser and Su (2008) FIT has features of Agreed amount of price, agreed period of purchasing of electricity. In the FIT methodology different renewable technologies have different purchasing tariff as FIT. The FIT has two types one is three tier tariff and levalized tariff. Under the three-tier tariff methodology there are different tariffs when years passed and in different periods of years. In levalized tariff option developers gets same tariff throughout the period of power purchasing agreement and tariff would equate the net present value of revenue from the plant's output with the net present value of the cost of production (Borenstein, 2012).

In the regulatory regime, regulatory mechanisms are different from country to country and it is not similar everywhere. It means that, due to the empirical specifics of regulatory spaces, including national legal traditions, organizational actors, and specific procedures has to be considered (Dubash, 2008). Thus, the FIT for renewable energy practiced during the period of 2007 up to now can be understood in that context. The tariff had been reviewed when and necessary and the issue had been arisen with the calculation of the tariff 2012. The parameters considered for the tariff calculation are annual plant factor, Capital Cost, Operation and maintenance cost, Fuel cost, debt equity ratio, annual Return on equity, Interest rates so and so forth. With the approval of Board of Directors of CEB, CEB submitted calculated FIT to the PUCSL. After reviewing of CEB FIT proposal, PUCSL approved different high tariff than CEB proposed tariff and published it. We used levalized cost option and the comparison is as follows.

Table-5.1. Comparison of Tariff proposed by PUCSL and CEB

Technology	CEB proposal (Tariff in LKR)	PUCSL proposal (Tariff in LKR)	Difference(LKR)	%
Mini Hydro	13.63	16.70	3.07	22.5
Mini Hydro Local	13.95	17.15	3.2	22.9
Wind	17.40	20.62	3.22	18.5
Wind Local	17.86	21.22	3.36	19.3
Biomass Dendro	23.56	25.09	1.53	6.5
Biomass (Agricultural& Industrial waste)	16.21	17.71	1.5	9.25
Municipal Solid Waste	No tariff	26.10	-	-
Waste Heat Recovery	7.77	9.19	1.42	18.3
Other Technology	23.56	25.09	1.53	6.5

Source: Ceylon Electricity Board data and Public Utilities Commission reports

The calculation was done based on the parameters and the tariff calculation formula. The reasons behind the difference and the comparison of the parameter figures given in below.

Table-5.2. Capital costs of Renewable Energy projects

Technology	CEB (LKR Mn.)	PUCSL (LKR Mn.)	Reasons
Mini Hydro	209	220	Rupee devaluation and inflation when calculating the capital cost, Renewable Energy developer's associations requested it.
Mini Hydro Local	214	221	
Wind	223	243	Wind Power association requested LKR254Mn
Wind Local	229	250	
Biomass Dendro	243	263	Bio Energy Association of Sri Lanka commented that Value Added Tax (VAT) on materials has to be taken into account when calculating capital cost of projects.
Biomass (Agricultural & Industrial waste)	243	263	Bio Energy Association of Sri Lanka commented that Value Added Tax (VAT)[a] on materials has to be taken into account when calculating capital cost of projects.
Waste heat Recovery	211	229	

Source: CEB tariff reports

a. At that time taxes were exempted for renewable energy projects which signed power purchase Agreements with CEB.

The decision of the PUCSL is given in the report on Renewable Energy Tariff calculation 2012 and it was decided that CEB capital cost figures are reasonable and acceptable. Further PUCSL has considered that the proposal of CEB contained a 3% depreciation of LKR against the US Dollar compared to December 2011 (113.90LKR/ 1USD), for Machinery & Equipment component of the capital cost estimates. PUCSL has adjusted the capital cost figures while considering the stakeholders' comments and sharp depreciation of the LKR in February 2012, the machinery and equipment component of the capital costs were adjusted to reflect the exchange rate variations up to July 2012 (PUCSL 2012).

The interest rate of the debt financing is an important parameter of the tariff calculation. CEB has calculated FIT based on the interest rate Average Weighted Lending Rate(AWLR) during the tariff calculation and it had been clarified from Lending Agencies on interest rate for this nature of business. Even in the PUCSL stake holders meeting it was highlighted by the Banks the applicable interest rate for this nature of business is Average Weighted Prime Lending Rate +3%(AWPLR+3%).But PUCSL has decided to consider Average Weighted Lending Rate (AWLR) +3% to calculate the approved rate of the tariff (PUCSL2012). PUCSL has considered additional 3% risk premium on top of the AWLR where the market risk already included in AWLR as per the banks. Discount rate or the weighted average cost of the capital had been considered by the PUCSL as 15.37 where as CEB figure is 16.37 at Debt: equity ratio 60:40. Return on Equity also important parameter and PUCSL stand on the CEB figures proposed as 22% ROE for 1-15 years and 20 % for 16-20 years.

The plant factors used by CEB and PUCSL are as follows.

Table-5.3. Comparison of plant factors

Technology	CEB value	PUCSL value	Reasons
Mini Hydro	42%	39%*	*PUCSL considered the submissions of stakeholders and the actual historical data collected by the Commission; the average plant factor of mini hydro plants during last 15 years was 39%. Considering the above, average plant factor of 39% was approved for Mini-hydro technology.
Mini Hydro Local	42%	39% *	
Wind	32%	32%	
Wind Local	32%	32%	
Biomass Dendro	80	80%	
Biomass (Agricultural & Industrial waste)	80	80%	No Change
Waste heat	67%	67%	

Source: CEB and PUCSL

The issue with previous plant factors is those power plants were developed by the investors under a different tariff method and in that development they could consider optimum size of the machines turbines in their financial method. If it considers for future plants that is not reasonable as these plants are site specific and new investors can consider 42% plant factor in their designs and financial models to achieve such plant factor forced by the FIT mechanism during design stage of the project.

The Operation and Maintenance cost proposed by the CEB accepted by the PUCSL without considering the other stakeholders' comments.

5.2. Key Interests and Influences on Renewable Energy Tariff Setting Regulations

In a regulatory regime there would be a dominant group(corporatism) which can influence the regulator for decision and also there may be several interested groups(pluralism) may influence for its decision and it indicates the level of influence by the shape of the decision (Mullins, 1997). Therefore, in any regulatory decision could be influenced by the interested groups and their capability indicates at what extend that they can influence to change the decisions of the regulator. In the tariff calculation methodology, it can be identified several groups. From utility side CEB Management and trade unions can be identified as two influential groups. Further the Associations established based on the specific technology such as Small Hydro Power Association, Wind Power Generators Association, Bio Energy Association can be identified as influential groups. During the 2012 FIT calculation they had submitted their proposals and try to get favorable tariff for them. However, in tariff calculation method it is necessary to consider the all the costs incur with renewable Energy. This was explained by Thatcher (2002) that assurance of the repayment of private investment is essential to recover expenditure and sufficient profits.

On the other hand, if the PUCSL did not approve good and attractive tariff that will effect on GOSL Policies on Renewable Energy Generation, at that time the target was 10% from Non-Conventional Renewable energy by year 2015 (National Energy Policy, GOSL 2008). So determination of the tariff has huge impact on achievement of policy targets. If the FIT offered is not favorable for the investors they will not invest. On the other hand, most of the Countries facilitate renewable energy development to reduce the dependence on fossil fuel. GOSL wants to enhance the contribution of renewable energy in electricity generation. In Sri Lanka general public wants to have reliable cost effective electricity for their consumption. If the regulatory decision incurs additional or unreasonable cost that would be a burden for the electricity customers. Therefore, as per the public interest theory in any regulatory process it has to be protected the general customers interest rather than other interest groups requirement. The basic principles of the policy are to reduce the imports of petroleum products and also protection of environment or minimize Green House Gas (GHG) emissions. This government policy on renewable energy generation and meet the policy targets are important aspects of future renewable energy generation and PUCSL has to consider these areas in the process of approving tariff approval. If the confidence of the investors loses about the confidence of the market which can be damaged to the corporate economy of the sector (Vithiatharan and Gomez, 2014). The attractive tariff for renewable energy is one of the success factor for capacity addition of renewable energy to the system.

However, with the announcement of PUCSL on new renewable energy FIT, CEB had objected the proposed tariff and refrained from implementing it. This was account for the interest of CEB to reduce their generation cost and thereby to recover the cost through the prevailing tariff system since the existing tariff is not sufficient enough to meet the cost. So CEB was not willing to pay higher tariffs for electricity purchasing. Then debate was started between CEB and PUCSL and PUCSL issued enforcement order under the provision of Sri Lanka Electricity Act enforcing CEB to implement it. Since PUCSL had approved the different FIT, they were not agreed to change the tariff as they want to maintain their stance. Then CEB filled a case against PUCSL. However, GOSL interfere in to the matter to resolve the issue amicably. As a result of GOSL interference, again a high official committee was established and they decided a new tariff for the renewable energy purchase. Further the matter was referred to the Attorney General to get legal opinion. The Attorney General informed that the PUCSL has no mandate to determine renewable energy tariff and utility has to follow the competitive bidding process for renewable energy development. This was really a shock for renewable energy developers and the development of renewable energy projects hampered as a result of it. The development of renewable energy projects in each year capacity in MW after introduction of Technology Specific Cost Based Tariff is as follows. Under this discussion the technologies of Hydro, Wind, Biomass, Solar considered as the impacts of tariff of such technologies are affected.

Table-5.5. Capacity addition of Renewable Energy

Year / Technology	2008	2009	2010	2011	2012	2103	2104	2015	2016	2017
Mini Hydro	33.6	23.35	3.7	22.25	31.07	37.4	25.79	15.4	28.11	16.62
Wind	0	0	30.85	10.0	32.8	4.8	40.0	10.0	0	0
Solar				1.36	0	0	0	0	20	30
Biomass	10.0	0	0	0.5	0	0.5	7.0	0.12	0.50	4.0

Source: Sri Lanka Sustainable Energy Authority, (2018)

This can be illustrated by following graph.

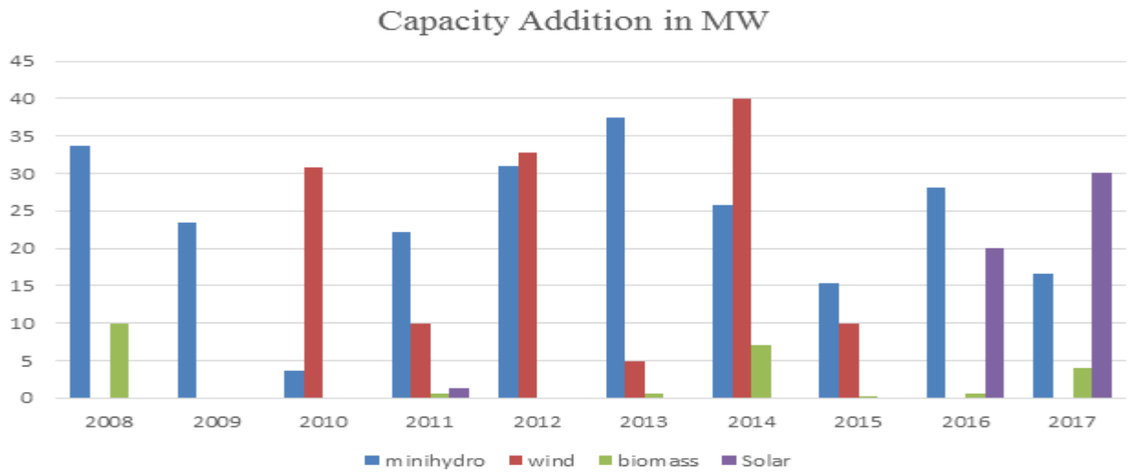

Figure-5.1. Capacity Addition of Renewable Energy during last 10years

Source: Ceylon Electricity board

It is very clear that the capacity addition of renewable energy reduced after the year 2014. This is the issue relevant with the tariff determination of the PUCSL and pressure exerted by CEB on implementation the declared FIT by the PUCSL. Due to this conflict the attorney General's opinion was to go for tenders for implementation of renewable energy projects. Tendering process had been implemented especially for wind and Solar projects but no single utility scale project implemented yet though the purchasing price had been reduced due to the competition.

The summary of renewable Energy power generation projects which have signed SPPs for the feed in Tariff published on 2014 and effective from 01.01.2012 are as follows.

Table-5.6. Renewable Energy capacity addition after 2014

Project Type	Commissioned		SPPA Signed		Grand Total	
	Number of Projects	Capacity (MW)	Number of Projects	Capacity(MW)	Number of Projects	Capacity(MW)
Mini Hydro	37	57.08	55	104.80	**92**	**161.88**
Dendro	03	6.02	05	16.74	**8**	**22.76**
Agro & Industrial Waste	01	0.08	01	2.50	**2**	**2.58**
Solar	05	50.00	02	20.00	**7**	**70.00**
Municipal Solid Waste	0	0	01	10.00	**1**	**10.00**
Total	**46**	**113.18**	**64**	**154.04**	**110**	**267.22**

Source: Sri Lanka Sustainable Energy Authority

The calculated annual generations of renewable energy electricity in the years based on the plant factors considered for tariff calculation, are as follows.

Table-5.7. Cash flow issue on implementation of CEB and PUCSL

Technology	Electricity generation (kWh)*/Annum	Difference between CEB proposed tariff and PUCSL tariff (LKR)	If CEB implemented PUCSL approved tariff additional cost could be bared (LKR)/Annum
Mini Hydro	210,008,736	3.07	644,726,819.00
Wind	0		
Biomass	64,333,440	1.53	64,333,440.00
Agriculture waste	560,640	1.5	840,960.00
Solar	29,000,000	1.5	43,800,000.00

*Considered only the power purchased under new tariff and assume that such power plants connected to the grid and generate electricity based on the plant factor considered during the tariff calculation.

Therefore, according to the above table it is clear that the additional cost could be borne by CEB for the above electricity purchasing per annum is approximately LKR 753,701,219 if they implement the PUCSL approved FIT. Normally power purchased agreements signs for 20 years period total cost would be approximately 20 times of such annual cost. This amount is an additional cost if CEB implemented PUCSL decision on FIT. This had to be passed to the customers by implementing either tariff increase or providing subsidiary from the Treasury to CEB.

5.2.1. Environmental Aspects

As per the legal opinion of Attorney General, CEB has not issued Letter of Intents(LOI) and has not signed power purchased agreements with any new renewable energy projects unless that project has valid permit before the enactment of the Sri Lanka Electricity(Amendment) Act. Due to this reason considerable amount of renewable energy projects have been standstill without being implemented. Since those renewable energy projects get delayed comparatively environmental friendly projects are not being implemented. There is substantial amount of new projects to be implemented due to these issues investors are facing difficulties.

5.2.2. Utilities Expenditures

In electricity market ensuring electricity prices reflect the economic cost of supply is a political challenge (Dornan, 2014). In Sri Lankan context it is difficult task to ensure the economic cost of electricity generation through the tariff mechanism as any increase of the electricity tariff would burgeon lot of issues in the society. That would cause difficulties to political leaderships and hence they will think twice to increase tariff to meet economic cost of the CEB for electricity generation. According to the CEB financial report 2017, CEB is recovering only LKR 16.00/kWh where the real economic cost is LKR 20.03/kWh, (CEB, 2017). It is clear, that CEB is not recovering the cost of the electricity supply through the electricity tariff. PUCSL has considered the grievance or the requests of renewable energy developers rather than the public interests. Operational efficiency is very important for any business and deliver the service in cost effective manner (Simintiras *et al*., 2015). In electricity sector operational efficiency is very important, even in electricity purchasing has to be done through cost effective manner. According to Elhauge (1991) some of the activities or results of the systems are not favorable for interests of the general public, hence it emphasizes that even in the regulatory system there would be some decisions of the regulator unfavorable for interest of general public. However, in a monopolistic market, utility has ability to stand against the regulators decision and put pressure to change regulators decision. This is also an another facet of regulatory capture. In fact, the change of the decision of regulator is not due to the influence it is because of the pressure of resistance from the strong utility. This can be defined as Monopolistic Utility Standing theory where utility can defend certain extend interest of the organization.

5.3. Approval of Least Cost Long Term Generation Expansion Plan

As per the Sri Lanka Electricity(amendment) Act 31 of 2013, CEB is supposed to prepare Least Cost Long Term Generation Expansion Plan(LCLTGEP) to meet demand growth for electricity. LCLTGEP is prepared for 20 years' period and it reviews after two years' period. The study is covered the approval process of LCLTGEP for the period of 2018-2037 period. Under the preparation of LCLTGEP, PUCSL agrees with CEB about the input parameters of the preparation of LCLTGEP. These parameters published for stakeholders' comments basically those input parameters are Reliability Criteria, Cost of Unserved Energy, Discount Rate, Consideration of Social Damage Cost, Electricity Demand Forecast, proposed candidate energy supply technologies, their costs and efficiency parameters, Fuel prices, Renewable technologies and their cost parameters and Scenarios selected for analysis and after finalization of it the parameters were given to CEB to follow for preparation of LCLTGEP. The parameters considered to prepare LCLTGEP are as follows as per the document of Regulatory Manual (2014) on input parameters for the Long Term Generation Expansion Plan 2018-2037.The input parameters and assumptions considered as the most important facts and the basis in the preparation of the LCLTGEP.

Reference date for the costs is 01.01.2017, exchange rate is LKR 148.88/1 USD and discount rate is 10% are the economic parameters agreed upon. There were several sensitivity studies and scenario analysis conduct to prepare the LCLTGEP such as Demand Forecast (High/Low), Discount Rate(High/Low), Fuel price fluctuations, Fuel Diversification Options, Energy mix with the introduction of Nuclear power, scenario with India Sri Lanka HVDC interconnection.

With the agreed parameters CEB had done the Sensitivity studies and prepared the CEB proposed LCLTGEP2018-2037 and submitted it to the PUCSL. CEB uses mainly the Wien Automatic System Planning (WASP IV) software to derive the generation plan. In the formula it was considered about the cost parameters to calculate the total cost of the plan. Based on the cost of the plan CEB has finalized the based case scenario of the next 20 years'. The CEB LCLTGEP base case scenario is basically based of the generation mix including Coal, Renewable, Natural Gas option etc.

As per the provisions in the Public Utilities Commission Act No. 32 of 2002 PUCSL invited public comments from stakeholders. Several parties submitted comments and made oral presentations in the process. However, after the public consultation process PUCSL gives the approval for PUCSL reviewed LCLTGEP 2018-2037 which is mainly comprising Natural gas, renewable energy sources. The summary of the points highlighted by individuals and groups submitted to PUCSL on long-term generation expansion plan is as follows.

According to above summary it can be observed that PUCSL received comments from stakeholders on change of parameters and on change of input parameters. After consideration of comments of stakeholders, the PUCSL has approved the LCLTGEP and sent to the CEB as a decision document. However, CEB did not agree to implement the decision document of LCLTGEP received from the PUCSL and they emphasized the disagreement with the PUCSL decision.

Differences of the planning code parameters between CEB base case scenario and PUCSL revised case scenario are as follows.

Table-5.8. Analysis on comments of Public hearings

Comment	No. of submission	Whether it is on input parameter or not	Percentage %
Adequacy of Share of Renewable Energy considered	17	No	47.2
Consideration of externalities	9	Yes	25.0
Impact of LKR depreciation on Cost of renewable based generation	6	Yes	16.7
Suitability of WASP to analyze new renewable technologies	4	No	11.1
Generation Planning Code in the Grid Code is no longer appropriate in preparing the Long-Term Generation Expansion Plan	4	No	11.1
Problems in fuel prices used for the preparation of the draft plan	2	Yes	5.6
Emphasis of Coal as the cheapest generation option	3	No	8.3
Cancellation of Sampur Coal plant and cost	1	No	2.8
The plan underestimates the expected cost reductions in renewable technology	3	No	8.3
Consideration of technological advances in renewable technologies in the plan -smart networks, -battery storage systems -vehicle charging -smart grids to mitigate stability issues	7	No	19.4
Plan has not considered Demand Side Management (DSM) initiatives of the government	6	No	16.7
Consideration of availability of Domestic Natural Gas in the plan	3	Yes	8.3
Compensation of additional cost for capacity addition of high cost renewables	2	No	5.6
Solar plants generate energy only in day hours and this will cause even more sharp night peak.	1	No	2.7
Even though border prices are used for the preparation of the plan, actual dispatch is conducted based on market prices of the fuel	2	Yes	5.6
Consideration of Transmission cost	2	Yes	5.6
Pessimistic Network losses forecast	2	Yes	5.6
Social issues with nuclear power plants in Sri Lanka	3	No	8.3
Milestones to be achieved to develop Nuclear power	2	No	5.6
Basis for having 5% amount of extra spinning capacity per MW of ORE,	2	Yes	5.6
Environmental impacts of renewable energy projects	2	No	5.6
Rights to curtail Variable Renewable Energy	2	No	5.6
Coal plants should not be considered, when Paris Agreement specifically, noted that Sri Lanka cancelled plans to build 4700 MW of coal-fired power generation.	2	Yes	5.6
Timely implementation of power plants should be ensured	3	No	8.3
Coal Jetty, harbor and fuel transport cost should be considered in the plan.	2	Yes	5.6
Slow implementation of government initiatives on solar roof top capacity additions	5	No	13.9
Need to consider the scarcity of land for power plants	1	No	2.7
Requirement for proper disposal mechanisms and destinations for thrown out solar panels will have to be planned now.	1	No	2.7
Consideration procurement of electricity through interconnections	1	No	2.7
Require identification of Policy Cost	1	No	2.7

Source: PUCSL decision on LCLTGEP 2018-2037

Table-5.9. Comparison of parameters

Parameter	CEB LCLTGEP 2018-2037	PUCSL LCLTGEP 2018-2037
Loss of Load Probability	0.2	0.5-1.5%
Reserve Margin	Above 2.5% and below 20% Upper limit	Above 10% and below 35%
Cost of Energy not Served	0.663USD/kWh	0.5 USD/kWh
Source :PUCSL and CEB		

Source: CEB and PUCSL

In both plans CEB and PUCSL have highlighted the loop falls against each other. The Summary is as follows.

Table-5.9. Comparison of PUCSL figures and CEB

Item	PUCSL comments	CEB comments
Demand Forecast	load factor improvement resulting off-peak demand increase is unrealistic	Considered past demand growth rate and also planned large scale development
Economic Costs	CEB has taken an effort to include border prices in to the planning process. CEB has not considered environmental externalities, local employment and other economic benefits of some technologies.	CEB has considered all the factors in the assessment, except environment externality cost.
Externality cost	PUCSL accepted the fact that there is no specific data available for local context. But 1.2 US Cents/kWh difference in externality costs is sufficient to tilt a coal dominant generation plan to a NG dominated plan, and all the recent studies reveal higher gaps in externality costs (between coal and NG)	CEB is in the view that best externality cost should be determined considering Sri Lankan context before incorporate to the Long Term plan.
Fuel Cost	Current prices are substantially different appears to misrepresent the actual pricing at the time of preparation of the plan using Long term (2015 and 2016) average, .	CEB has considered the 2-year average fuel prices and had conducted sensitivity analysis.
Candidate Plant Size, Technologies and Scenarios	Forced conditions of the revised case: 300MW Coal Plants (Sub Critical) were not considered for the optimization due to low efficiency and high emissions ,600MW Super Critical Coal Plant option was allowed from 2025 onwards considering a feasible timeframe for implementation and Pump Storage Plant option was forced.	Forced conditions imposed additional constraints to deviate away from least cost candidate options and it violates the least cost planning principles.
Energy Security	Sri Lanka has built one coal power station and relies on it to supply about 40% of the current demand. Also Natural Gas deposits have been discovered in the North- Western sea area of the country and any development of that resource would depend heavily on the prospective demand from the power sector.	CEB base case has considered a mix of Natural gas and coal based thermal plants which ensure energy security and robustness in fuel price fluctuations

Sources: PUCSL revised LCLTGEP 2018-2037 Comments of CEB on the PUCSL decision on LCLTGEP 2018-2037

The above summarized differences among others highly criticized by CEB as the argument of preparation of LCLTGEP has to be done by the Utility not by the Regulator. However due to this conflict implementation of identified generation projects got delayed and hampered as CEB has refused to implement the LCLTGEP approved by the PUCSL.

6. Discussion

In the renewable energy tariff calculation process, it was not clearly manifested by regulator on no regulatory capture and it is responsibility of regulator to show there is no any regulatory capture or prevent such initiatives if any while introducing a robust mechanism. The decisions made or to be made by regulator delineates the level of capture of utility. But in the FIT calculation process the PUCSL considers the high interest rate and low plant factor considering the submissions of the renewable energy developers. The influence might cause to consider such favorable factors for renewable energy developers to come up with high tariff. There is no evidence that PUCSL has directed CEB to go for tendering process to select renewable energy developers in order to reduce the cost of the generation where public has interest to reduce the cost of the electricity generation and capacity addition of green energy to the system. The interesting point is CEB has not implemented the PUCSL decision on FIT of renewable energy and CEB rejected to implement it. Due to that PUCSL was not in a position to take any action against CEB.

In the process of preparation of LCLTGEP regulator revised the plan even using some of the parameter figures which were not agreed upon with the utility. That causes the different output from the revision and the PUCSL decision was drastically different from the CEB proposal. That causes origination of debate between CEB and PUCSL. Due to that controversy CEB had not implemented power generation projects. The delay time is more than one year and two months. This may cause power shortage in the future where general public wants to have adequate power to meet their demand. Hence the public interest is to have adequate electricity generation capacity to meet the demand. But regulator was unable to achieve that objective and the approval for LCLTGEP was delayed. CEB oppose to accept the PUCSL decision on LCLTGEP and implement it. Due to enormous pressure from various parties such as CEB trade unions, Political leaders etc. finally, PUCSL approved CEB base case scenario with some conditions. That gives evidence for the case that utility can reverse the regulators decision by other means. As per the public interest theory regulator should make decisions which are favorable for general public hence implementation of the PUCSL decision by the utility is important in the monopoly market. If the utility refuses the regulators decision that would be a conflict. In such kind of situation arises, the regulator can implement punitive action. Adams *et al.* (2007) explained the situation with a model as follows. It was depicted by Adams *et al.* (2007) regulatory risk with capture and abuse power as follows.

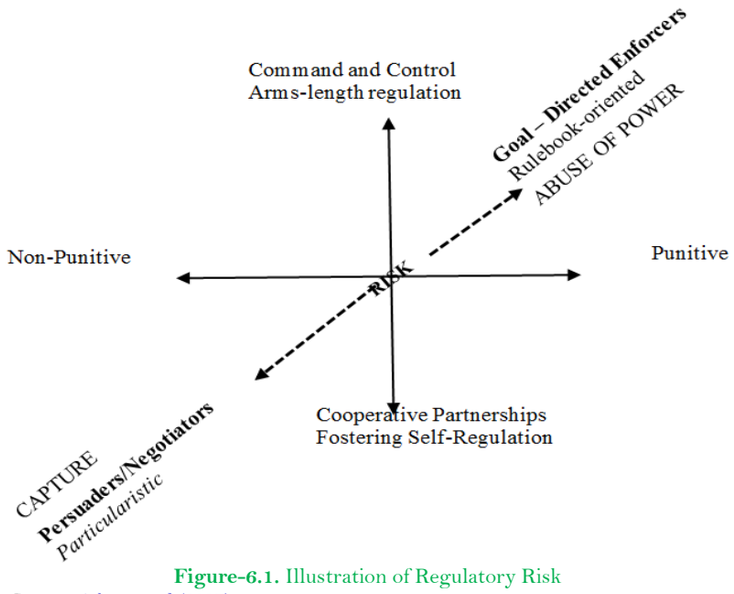

Figure-6.1. Illustration of Regulatory Risk
Source: Adams *et al.* (2007)

This indicates that if the Punitive actions can be taken by the regulator against the utility, command and control power is with the regulator, hence there is a high risk of abuse of power by the regulator. If the regulator cannot use punitive action, there would be difficulties to implement the decision of regulator through the utility. However, in Sri Lankan context command and control of the regulator on utility is very low as there is only one utility and trade unions in the utility are also powerful to resist decisions of regulator if those are not favorable for them. The one of the reason PUCSL highlighted is that GOSL policy on energy generation is not a clear policy. Then GOSL has obtained approval of the Cabinet of ministers for electricity generation mix. This indicates that the requirement of the GOSL to resolve the issue amicably. Finally, PUCSL granted approval for CEB proposal. PUCSL couldn't stand their decision further.

Therefore, that can be depicted as the below figure. This provides additional strength to the utility to resist any unfavorable decision of the regulator.

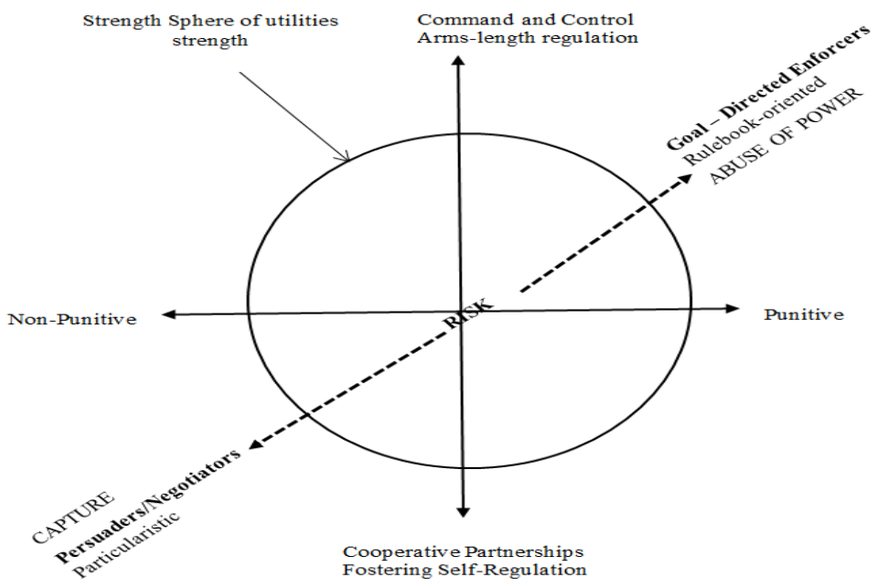

Figure-6.2. Illustration of Utilities resistance for regulators decision in the monopolistic Market
Source: Adams *et al.* (2007) model developed by Authors

In the context of Sri Lanka, the utility can resist the regulators decision if they see that there is abuse of power of regulator, biased towards another stakeholders the decision is not favorable for the interest of the public and or shows some elements of regulatory capture. It is something that there is a rigid sphere in the process where regulator cannot penetrate to do any abuse or activity leads to the regulatory capture. This can be defined the utility stiffness of the resistance. Depend on the level of the strength of the Utility, the level and duration of resistance is determined. However, if the utility resists any decision without good reasoning there should be a way to control such action by the regulator. But the issue here is no control by regulator to prevent such situation other than through the legal procedure against to the utility, if the utility resists regulators decision without any proper ground or evidence of abuse of power. Further in such situations government can interfere to control utilities resistance. In the above two cases CEB refused to implement the decisions of PUCSL. In renewable energy tariff calculation PUCSL issued an enforcement order, but CEB strongly refused it and they enter to the legal process. However, GOSL interfered to the matter and resolve it. But the issue made damages to the renewable energy sector especially the new capacity addition hampered. Hence it is clear that utility displayed courage to refuse the implementation of PUCSL decision and to reverse it as utility was thinking that the renewable energy tariff was prepared by PUCSL considering only the renewable energy developers' benefits.

In the second incident, the CEB did not implement the decision of PUCSL on LCLTGEP. According to the PUCSL, they received the comments from some stakeholders. But such stakeholders are keen on removal of Coal power generation option where CEB Engineers pressuring to include Coal power plants into the LCLTGEP. On the other hand, as per the provisions of the section 43(2) of Sri Lanka Electricity(amendment) Act No. 31 of 2013, PUCSL can only get the views from distribution and generation licensees, on proposed LCLTGEP of CEB. However most of influential stakeholders who present their case stressed the PUCSL to change the CEB proposal. But CEB as the only buyer of the electricity refuses to implement the revised LCLTGEP. Later with the pressure from trade unions, political authority etc., PUCSL has granted the approval for LCLTGEP submitted by CEB, subjected to some conditions. However general public needs timely implementation of power plants and provide uninterrupted electricity service continuously. The implementation of identified projects got delayed which would be leading to difficulties in meeting future demand and also compel to go for emergency power purchasing which is badly criticized by various stakeholders in different forums. Any way it can be observed that if the utility is strong enough to resist the regulators decision in a monopoly market will be led to difficult situation in future for the customers in terms of power generation. One of the best option to prevent the regulatory capture is availability of information on the regulators decision (PUCSL,2014). With the availability of the information on the basis of the decision is not good enough to prevent the regulatory capture. In two cases discussed in this article relevant all the information available, but though information available still the utility is highlighting that the based information is wrong.

7. Conclusion

According to Interest Group theory, all the participants in the political process act in their self-interest (Elhauge, 1991). As shown above, this notion applies to regulation of the renewable energy tariff determining process. The developers who submitted proposals or comments on utilities' proposal have their own interest to increase the tariff so that they earn a higher return. Utility also has its own interest on calculation as they proposed the tariff proposal and also they are not sure whether they can receive revenue to meet the increased tariff as the customer tariff has not revised adequately to meet the demand. According to the Ministry of Finance and Mass media in 2016 and 2017 the CEB suffered revenue gap of LKR Mn. 14,499 and 49,231 respectively (Annual Report, 2017). Otherwise they have to suffer further with worsen financial position and they will face difficulties with future benefits. The Regulator, X, also has some interests as its members' benefit (Carpenter and Moss, 2013) with increased tariff from interest groups.

However, though the regulator made a decision that can be reversed by the Utility in the monopoly market if utility strong enough to do that. If the decision favorable for one particular stakeholder group and not favorable for general public and the utility, utility can forcefully reverse the regulators decision which is acceptable if it benefitted for general public. But if the decision is favorable for general public if utility forcefully reversed it that cannot be accepted. This can be called forceful regulator capture even without influence the regulator, utility can reverse the regulators decision either it favorable for general public or not in the monopolistic market. The level of the control of the regulator depends on the strength of the utility in the monopoly market. In that context as the policy maker, government can play vital role to resolve or control such situation in terms of wellbeing of the society. In a monopolistic electricity market, if the utility is strong enough to resist the decisions of the regulator it will lead devastation situation in the power sector.

References

Adams, G., S. Hayes, S. Weierter and J. Boyd, 2007. Regulatory capture: Managing the risk. Australian Public Sector Anti-Corruption Conference, Sydney, 24.

Annual Report, 2017. Ministry of Finance and Mass Media, Sri Lanka.

Borenstein, S., 2012. The private and public economics of renewable electricity generation. Journal of Economic Perspectives, 26(1): 67-92.

Byrne, J. and C. Govindarajalu, 1997. Power sector reform: Key elements of a regulatory framework. Economic and Political Weekly, 32(31): 1946-1947.

Carpenter, D. and D.A. Moss, 2013. Preventing regulatory capture: Special interest influence and how to limit it. Cambridge University Press.

Carter, R.M. and R.K. Morgan, 2017. Regulatory trust and failure–a case study of coal seam gas in New South Wales, Australia. Journal of Environmental Planning and Management, 61(10): 1789-1804. Available at: https://doi.org/10.1080/09640568.2017.1372277.

Corry, D., D. Souter and M. Waterson, 1994. Regulating our utilities. Institute for Public Policy Research.

Crew, M.A. and C.K. Rowley, 1988. Toward a public choice theory of monopoly regulation. Public Choice, 57(1): 49-67.

Cubbin, J. and J. Stern, 2006. The impact of regulatory governance and privatization on electricity industry generation capacity in developing economies. The World Bank Economic Review, 20(1): 115-141. Available at: https://doi.org/10.1093/wber/lhj004.

Dornan, M., 2014. Reform despite politics? The political economy of power sector reform in Fiji, 1996–2013. Energy Policy, 67: 703-712. Available at: https://doi.org/10.1016/j.enpol.2013.11.070.

Dubash, N.K., 2008. Independent regulatory agencies: A theoretical review with reference to electricity and water in India. Economic and Political Weekly: 43-54.

Elhauge, E.R., 1991. Does interest group theory justify more intrusive judicial review? Yale Law Journal, 101(1): 31-110. Available at: https://doi.org/10.2307/796935.

Engstrom, D.F., 2012. Corralling capture. Federalist Society Annual Student Symposium,Stanford Law School, Palo Alto.

Hantke-Domas, M., 2003. The public interest theory of regulation: Non-existence or misinterpretation? European Journal of Law and Economics, 15(2): 165-194.

Lesser, J.A. and X. Su, 2008. Design of an economically efficient feed-in tariff structure for renewable energy development. Energy Policy, 36(3): 981-990. Available at: https://doi.org/10.1016/j.enpol.2007.11.007.

Macey, J.R., 1986. Promoting public-regarding legislation through statutory interpretation: An interest group model. Columbia Law Review, 86(2): 223-268. Available at: https://doi.org/10.2307/1122704.

Mullins, D., 1997. From regulatory capture to regulated competition: An interest group analysis of the regulation of housing associations in England. Housing Studies, 12(3): 301-319. Available at: https://doi.org/10.1080/02673039708720898.

Phillips, C.F., 1993. The regulation of public utilities: Theory and Practice Public Utilities Reports.Inc,Arlington,VA. Public Utilities Commission Act 35 of 2002, Sri Lanka.

Regulatory Manual, 2014. Version 3,Public Utilities Commission,Sri Lanka.

Schwartz, R., 2007. Regulatory ethics in theory and practice: Comparing two cases. Public Integrity, 10(1): 37-52. Available at: https://doi.org/10.2753/pin1099-9922100103.

Simintiras, A.C., Y.K. Dwivedi, G. Kaushik and N.P. Rana, 2015. Should consumers request cost transparency? European Journal of Marketing, 49(11/12): 1961-1979. Available at: https://doi.org/10.1108/ejm-02-2015-0086.

Thatcher, M., 2002. Delegation to independent regulatory agencies: Pressures, functions and contextual mediation. West European Politics, 25(1): 125-147. Available at: https://doi.org/10.1080/713601588.

Vithiatharan, V. and E.T. Gomez, 2014. Politics, economic crises and corporate governance reforms: Regulatory capture in Malaysia. Journal of Contemporary Asia, 44(4): 599-615. Available at: https://doi.org/10.1080/00472336.2014.923634.