



MINISTRY OF ENERGY
OF GEORGIA



PROGRAMME FUNDED BY THE EU



Current Lighting Market in Georgia

Presented by Mikheil Mumladze

Head of Analytical Department

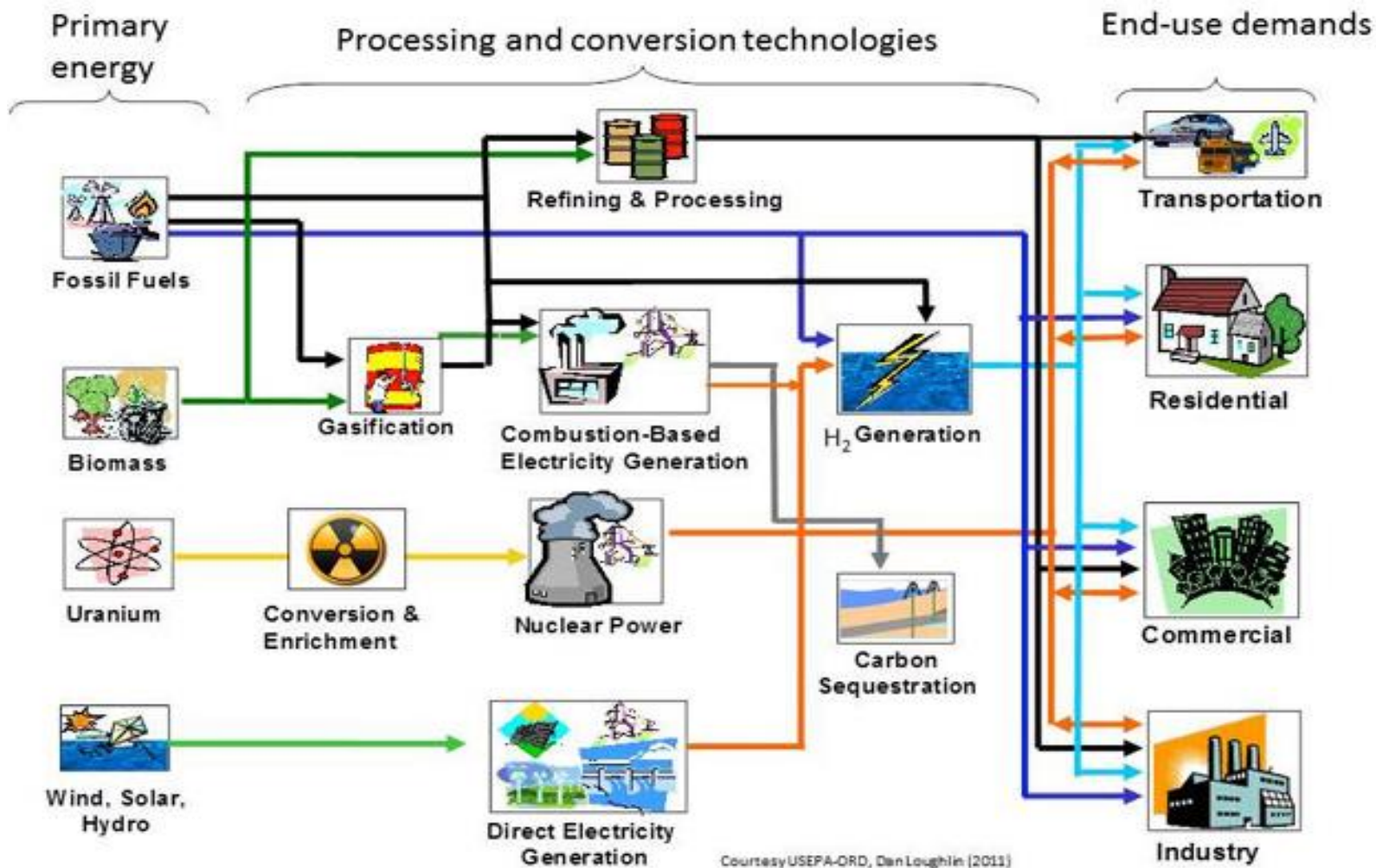
Ministry of Energy of Georgia

Tbilisi, 16 December 2015

Agenda

1. Reference Energy System
2. Existing data & Challenges
3. Residential & commercial Technology Options in MARKAL Georgia Modeling

Simplified Reference Energy System



Import/Export of Lighting Technologies

Description	Qty			Amount		
	2013	2014	2015	2013	2014	2015
Import	13,021,643.70	15,169,454.00	9,984,997.00	4,914,469.92	5,158,634.68	3,749,334.87
Domestic Directional Lighting Technologies	9,325,945.70	7,784,471.00	5,405,023.00	3,097,049.06	2,873,030.44	2,147,943.97
8539 22 900 00 Halogen	7,859,360.70	6,092,162.00	4,024,604.00	1,304,338.46	925,694.60	746,456.73
8539 31 900 00 CFL	1,466,585.00	1,692,309.00	1,380,419.00	1,792,710.60	1,947,335.84	1,401,487.23
Domestic Non-Directional Lighting technologies	3,062,512.00	6,285,346.00	3,648,347.00	846,750.09	1,174,177.26	741,299.39
8539 21 920 00 GLS > 100W ~	811,653.00	1,345,459.00	348,666.00	318,365.61	402,941.11	163,713.93
8539 21 980 00 GLS < 100W ~	2,250,859.00	4,939,887.00	3,299,681.00	528,384.47	771,236.15	577,585.46
Street Lighting Technologies	633,186.00	1,099,637.00	931,627.00	970,670.78	1,111,426.99	860,091.51
8539 32 100 00 High Pressure Mercury Vapour	5,287.00	1,726.00	3,842.00	13,754.67	4,473.87	6,185.05
8539 32 500 00 High Pressure Sodium	63,466.00	46,008.00	11,590.00	132,325.13	102,893.90	28,123.47
8539 32 900 00 Metal Halide	67,055.00	132,642.00	47,156.00	337,160.62	283,450.27	260,395.32
8539 39 000 00 Other (Possibly LED)	497,378.00	919,261.00	869,039.00	487,430.36	720,608.95	565,387.68
Export	(1,440,232.00)	(94,603.00)	(72,192.00)	(238,899.46)	(27,312.17)	(32,500.72)
Domestic Directional Lighting Technologies	(1,439,104.00)	(49.00)	(31.00)	(231,387.93)	(426.07)	(3,608.31)
8539 22 900 00 Halogen	(1,437,904.00)	(42.00)	(1.00)	(228,714.71)	(187.16)	(1,347.22)
8539 31 900 00 CFL	(1,200.00)	(7.00)	(30.00)	(2,673.22)	(238.90)	(2,261.09)
Domestic Non-Directional Lighting technologies	(255.00)	(20,595.00)	(1,425.00)	(2,955.47)	(11,549.21)	(6,875.28)
8539 21 920 00 GLS > 100W ~	(23.00)	(15,612.00)	(17.00)	(365.41)	(10,238.28)	(746.07)
8539 21 980 00 GLS < 100W ~	(232.00)	(4,983.00)	(1,408.00)	(2,590.06)	(1,310.93)	(6,129.21)
Street Lighting Technologies	(873.00)	(73,959.00)	(70,736.00)	(4,556.05)	(15,336.89)	(22,017.14)
8539 32 900 00 Metal Halide	(108.00)	(80.00)	(90.00)	(3,315.70)	(2,475.17)	(13,034.62)
8539 39 000 00 Other (Possibly LED)	(765.00)	(73,879.00)	(70,646.00)	(1,240.35)	(12,861.72)	(8,982.52)
Grand Total	11,581,411.70	15,074,851.00	9,912,805.00	4,675,570.46	5,131,322.51	3,716,834.14

Electricity Consumption by Lightings based on BAU Scenario with association of investment costs

Sectors/Period (BAU Scenario)	'2012	'2015	'2018	'2021	'2024	'2027	'2030	'2033	'2036	Total
Consumption in TWh	1,045.08	1,582.02	1,437.41	1,612.29	1,753.82	1,924.76	2,110.97	2,314.07	2,535.12	16,315.55
Commercial Sector Lighting	347.67	344.33	369.17	401.33	435.67	462.56	490.06	518.17	546.53	3,915.47
Public Sector Lightings	57.94	55.08	60.05	65.56	71.49	76.84	82.53	88.79	95.46	653.75
Residential Sector Lightings	639.47	1,182.61	1,008.19	1,145.39	1,246.67	1,385.36	1,538.39	1,707.11	1,893.14	11,746.33
Costs in Million EUR		4.26	9.83	10.28	16.15	17.78	19.59	21.58	23.65	123.13
Commercial Sector Lighting		3.50	7.65	9.11	10.83	12.58	14.58	16.87	19.49	94.61
Public Sector Lightings		0.36	0.40	0.42	0.48	0.52	0.55	0.54	0.36	3.64
Residential Sector Lightings		0.40	1.79	0.74	4.85	4.68	4.46	4.17	3.80	24.88

Electricity Consumption by Lightings based on LEDS 18% Scenario with association of investment costs

Sectors/Period (LEDS18%Scenario)	'2012	'2015	'2018	'2021	'2024	'2027	'2030	'2033	'2036	Total
Consumption in TWh	1,045.08	1,306.83	911.46	494.55	440.36	373.47	403.78	356.28	368.58	5,700.39
Commercial Sector Lighting	347.67	344.33	369.17	188.94	189.06	182.28	202.06	143.42	144.14	2,111.06
Public Sector Lightings	57.94	54.36	56.04	57.52	58.83	59.08	59.00	58.56	57.67	519.00
Residential Sector Lightings	639.47	908.14	486.25	248.08	192.47	132.11	142.72	154.31	166.78	3,070.33
Costs in Million EUR		4.37	17.68	32.42	39.04	44.56	48.66	76.49	87.92	351.14
Commercial Sector Lighting		3.50	7.65	15.07	17.74	20.43	22.65	48.47	58.06	193.57
Public Sector Lightings		0.60	0.57	0.57	0.95	1.02	1.03	1.02	0.68	6.44
Residential Sector Lightings		0.27	9.47	16.78	20.35	23.11	24.98	27.00	29.18	151.13

Net off Scenario. The difference between BAU and LEDS 18% scenarios

Sectors/Period (Net off Scenario)	'2012	'2015	'2018	'2021	'2024	'2027	'2030	'2033	'2036	Total
Consumption in TWh	(0.00)	275.19	525.96	1,117.74	1,313.46	1,551.29	1,707.20	1,957.79	2,166.54	10,615.16
Commercial Sector Lighting	(0.00)	0.00	0.00	212.39	246.61	280.28	288.00	374.75	402.39	1,804.42
Public Sector Lightings	-	0.72	4.01	8.04	12.66	17.76	23.53	30.24	37.79	134.75
Residential Sector Lightings	(0.00)	274.47	521.94	897.31	1,054.19	1,253.25	1,395.67	1,552.81	1,726.36	8,676.00
Costs in Million EUR		(0.10)	(7.85)	(22.14)	(22.88)	(26.78)	(29.07)	(54.91)	(64.27)	(228.01)
Commercial Sector Lighting		-	-	(5.96)	(6.91)	(7.85)	(8.07)	(31.60)	(38.57)	(98.95)
Public Sector Lightings		(0.23)	(0.18)	(0.14)	(0.47)	(0.50)	(0.48)	(0.48)	(0.32)	(2.81)
Residential Sector Lightings		0.13	(7.68)	(16.04)	(15.50)	(18.43)	(20.52)	(22.83)	(25.38)	(126.25)

Break down off technology options

Sectors/Period (Net off Scenario)	'2012	'2015	'2018	'2021	'2024	'2027	'2030	'2033	'2036	Total
Commodity Consumption		275.19	525.96	1,117.74	1,313.46	1,551.29	1,707.20	1,957.79	2,166.54	10,615.16
Commercial Public Lighting		0.7	4.0	8.0	12.7	17.8	23.5	30.2	37.8	134.7
Com.Public Lighting.ELC.00.Generic Lamp.		-	-	-	-	-	-	-	-	-
Com.Public Lighting.ELC.06.Generic Lamp. available		-	3.6	8.2	13.3	19.2	25.8	33.4	42.0	145.4
Com.Public Lighting.ELC.12.Flourescent.Lamp.		1.3	1.3	1.1	1.0	0.8	0.6	0.3	0.1	6.5
Com.Public Lighting.ELC.12.LED.Lamp.		(0.5)	(0.9)	(1.3)	(1.7)	(2.2)	(2.8)	(3.4)	(4.3)	(17.1)
Commercial Lighting		-	-	212.4	246.6	280.3	288.0	374.8	402.4	1,804.4
Com.Lighting.ELC.00.Compact Fluorescent.		-	-	-	-	-	-	-	-	-
Com.Lighting.ELC.00.Halogen.		-	-	-	-	-	-	-	-	-
Com.Lighting.ELC.00.Incandescent.		-	-	-	-	-	-	-	-	-
Com.Lighting.ELC.06, Fluorecence lamps (normal, co		-	-	(70.9)	(82.2)	(93.4)	(95.9)	36.4	74.5	(231.5)
Com.Lighting.ELC.06, Incandescence lamps available		-	-	283.3	328.8	373.7	383.9	392.1	397.5	2,159.3
Com.Lighting.ELC.09.Best available techniques (LED		-	-	-	-	-	-	(53.8)	(69.6)	(123.4)
Residential Lighting		274.5	521.9	897.3	1,054.2	1,253.3	1,395.7	1,552.8	1,726.4	8,676.0
Residential lighting, incandescence		274.5	567.3	936.9	1,145.8	1,362.3	1,517.0	1,687.9	1,876.4	9,368.1
Residential lighting, Compact fluorescent		-	-	56.0	-	-	-	-	-	56.0
Rsd.Lighting.ELC.00. Best available techniques		-	(45.4)	(95.6)	(91.6)	(109.0)	(121.3)	(135.1)	(150.1)	(748.1)
Rsd.Lighting.ELC.00.Compact Fluorescent.		-	-	-	-	-	-	-	-	-
Rsd.Lighting.ELC.00.Halogen.		-	-	-	-	-	-	-	-	-
Rsd.Lighting.ELC.00.Incandescent.		-	-	-	-	-	-	-	-	-
Rsd.Lighting.ELC.00.LED.		-	-	-	-	-	-	-	-	-
Annualized Investment Cost (Mil. EURO)		(0.10)	(7.85)	(22.14)	(22.88)	(26.78)	(29.07)	(54.91)	(64.27)	(228.01)
Commercial Public Lighting		(0.2)	(0.2)	(0.1)	(0.5)	(0.5)	(0.5)	(0.5)	(0.3)	(2.8)
Com.Public Lighting.ELC.06.Generic Lamp. available		-	0.0	0.0	0.1	0.1	0.1	0.2	0.1	0.6
Com.Public Lighting.ELC.12.Flourescent.Lamp.		0.1	0.0	0.1	0.0	0.1	0.0	0.0		0.4
Com.Public Lighting.ELC.12.LED.Lamp.		(0.4)	(0.2)	(0.3)	(0.6)	(0.6)	(0.6)	(0.6)	(0.4)	(3.9)
Commercial Lighting		-	-	(6.0)	(6.9)	(7.9)	(8.1)	(31.6)	(38.6)	(99.0)
Com.Lighting.ELC.06, Fluorecence lamps (normal, co		-	-	(7.9)	(9.2)	(10.5)	(10.8)	4.1	8.4	(26.0)
Com.Lighting.ELC.06, Incandescence lamps available		-	-	2.0	2.3	2.6	2.7	2.7	2.8	15.1
Com.Lighting.ELC.09.Best available techniques (LED		-	-	-	-	-	-	(38.4)	(49.7)	(88.1)
Residential Lighting		0.1	(7.7)	(16.0)	(15.5)	(18.4)	(20.5)	(22.8)	(25.4)	(126.3)
Residential lighting, incandescence		0.1	0.3	0.4	0.5	0.6	0.7	0.8	0.9	4.4
Residential lighting, Compact fluorescent		-	-	0.2	-	-	-	-	-	0.2
Rsd.Lighting.ELC.00. Best available techniques		-	(7.9)	(16.7)	(16.0)	(19.1)	(21.2)	(23.6)	(26.3)	(130.9)

Commercial Technology Options – Lighting

Public & Commercial Lighting					
Technology	<u>Utilization</u>	<u>Efficiency</u>	<u>Fix O&M</u>	<u>Purchase Price</u>	<u>Var O&M</u>
Units	dec fraction	fraction or factor	Million €/Pja	Million €/Pja	Million €/Pja
<u>Public Lighting</u>					
Generic lamp - existing	1.0	1.0	0.001		
Generic lamp - 2015	1.0	1.0	0.008	5.4405	0.0008
Flourescent lamp - 2015	1.0	4.0	0	21.762	0.0008
Halogen lamp - 2015	1.0	2.0	0	32.643	0.0008
LED Lamp - 2015	1.0	10.0	0	55.4931	0.0008
<u>Commercial Buildings</u>					
Incandescent - existing	1.0	1.0025	0.001		
Incandescent - 2015	1.0	1.0	0.008	5.4405	0.0008
Halogen - existigng	1.0	2.0	0.001		
Halogen - 2015	1.0	2.0	0.008	32.643	0.0008
Compact Fluorescent - existing	1.0	4.0	0.001		
Compact Fluorecence - 2015	1.0	4.0	0.008	21.762	0.0008
LED - 2018	1.0	10.0	0.008	55.4931	0.0008

Residential Technology Options – Lighting

Residential Lighting					
Technology	<u>Utilization</u>	<u>Efficiency</u>	<u>Fix O&M</u>	<u>Purchase Price</u>	<u>Var O&M</u>
Units	dec fraction	fraction or factor	Million €/Pja	Million €/Pja	Million €/Pja
Lighting, Incandescent - existing	1.0	1.0	0.001		
Lighting, Halogen - existing	1.0	2.0	0.001		
Lighting, Compact Fluorescent - existing	1.0	4.0	0.001		
Lighting, LED - existing	1.0	4.0	0.001		
Lighting, Incandescent - base	1.0	1.0	0.0008	0.3639	0.007
Lighting, Halogen - base	1.0	2.8	0.0008	0.4549	0.007
Lighting, Compact Fluorescent - base	1.0	4.6	0.0008	0.7161	0.007
Lighting, LED - base	1.0	12.5	0.0008	10.8685	0.007



Thank You



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