Ministry of Water & Irrigation
وزارة المياه والري

Action Plan

for the implementation of the

"Energy Efficiency and Renewable Energy Policy for the Jordanian Water Sector"

2015

A) Energy Efficiency

Short Term Actions					
Program 1: Rehabilitation of Water Fields and Pumping stations					
Measures/Actions: 1. Rehabilitation of Civil work, 2. Rehabilitation and/or install the following: A. Raiser pipes, B. Suction and discharge pipes, C. Pumps, Transformers, D. Earthing system, E. Panels, F. Cables, G. PLC's, H. Local SCADA Systems					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**
1. Rehabilitation of water fields in Zarqa & Al balqa	1. Miyahona/ Zarqa, 2. WAJ/ Al Balqa	Corridor WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	1,326,320	
		Merhib WF	1. Annual Water Pumped (m^3/year)	1,086,078	1,086,078
			2. Annual Electrical Power consumption (kWh/year)	3,589,044	699,325
			3. Annual Electrical Power Saving (kWh/year)	2,889,720	
		Rajib WF	1. Annual Water Pumped (m^3/year)		

			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	957,054	
		South Shouneh WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	518,505	
		Al baqa'a WF	1. Annual Water Pumped (m^3/year)	1,354,030	1,354,030
			2. Annual Electrical Power consumption (kWh/year)	2,029,166	1,338,135
			3. Annual Electrical Power Saving (kWh/year)	691,031	
	Project Energy Saving (kWh/ Year)	6,382,630			
2. Rehabilitation of Well fields in Karak & Aqaba	1. WAJ /Karak, 2. Aqaba company	Lajoun WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	1,322,420	
		Mneisheer WF	1. Annual Water Pumped (m^3/year)		

			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	1,430,197	
	Project Energy Saving (kWh/ Year)	2,752,617			
3. Rehabilitation of Well fields operated by Miyahuna WC	Miyahuna	Abu Zeeghan WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	1,794,579	
	Project Energy Saving (kWh/ Year)	1,794,579			
4. Rehabilitation of Well fields operated by Yarmook WC	Yarmook Company	A. Wadi Al Arab WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	1,069,419	
		B. Azraq WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	2,903,783	

		C. Al Aqeb WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	3,359,203	
		D. Zniaeh WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	637,795	
		E. Oyoon WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	2,342,793	
		F. Mndah WF	1. Annual Water Pumped (m^3/year)	838,843	838,843
			2. Annual Electrical Power consumption (kWh/year)	1,008,217	891,585
			3. Annual Electrical Power Saving (kWh/year)	116,632	
		G. Kilo WF	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption		

			(kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	181,342	
		H. Noaymeh WF	1. Annual Water Pumped (m^3/year)	273,268	273,268
			2. Annual Electrical Power consumption (kWh/year)	521,298	232,468
			3. Annual Electrical Power Saving (kWh/year)	288,830	
	Project Energy Saving (kWh/ Year)	10,899,797			
5. Rehabilitation of Pump Stations operated by Miyahuna WC	Miyahuna Company	A. Zay PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	17,661.962	
		B. Damishkhi PS	1. Annual Water Pumped (m3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	875,179	
		C. Al Muntaza	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		

			3. Annual Electrical Power Saving (kWh/year)	9,380,147	
		D. Wadi Eseer PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	390,338	
		E. Ain Gazal PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	1,522,700	
	Project Energy Saving (kWh/ Year)	29,830,326			
6. Rehabilitation of Pump Stations operated by Yarmook WC	Yarmook Company	A. Wadi Alarab PS0	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	5,858,009	
		B. Wadi Alarab PS1	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	7,706,800	

		C. Juhifiya PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	420,000	
	Project Energy Saving (kWh/ Year)	13,984,809			
7. Rehabilitation of Pump Stations in Karak, Tafileh and Zarqa	1. WAJ Karak 2. WAJ Zarqa 3. WAJ Tafileh	A. At Tween PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	621,676	
		B. Hashemiyyeh PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	151,020	
		C. Al Gwair PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	626,940	

		D. Qatraneh PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	840,764	
		E. As Safi PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	288,206	
		F. Al Qaser PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	236,614	
		H. Zibdeh PS	1. Annual Water Pumped (m^3/year)		
			2. Annual Electrical Power consumption (kWh/year)		
			3. Annual Electrical Power Saving (kWh/year)	794,615	
	Project Energy Saving (kWh/ Year)	3,559,835			
	Total Projects Energy Saving (kWh/ Year)			**69,204,593**	

	Ton CO_2 Reduction/ Year			**50,381**		
8. Al Bqourieh			1. Annual Water Pumped (m^3/year)	-		-
			2. Annual Electrical Power consumption (kWh/year)	4,688,000		3,176,372
			3. Annual Electrical Power Saving (kWh/year)	1,500,000		
9. Rehabilitation of Al Zarqa Pump Station. JICA						
10. Rehabilitation of trunk line connecting AZRAQ pump station to KHAW tank. JICA						
11. Rehabilitation of trunk line connecting ALHALABAT pump station to KHAW tank. JICA						
12. Installation 600mm Pipe from AZRAQ pump station to ALBATRAWY tank. JICA						
13. Rehabilitation 600mm, 4.1 km long Pipe from AZRAQ to KHAW tank. JICA						
14. Install water meters and valves in pump station several locations in Al Zarqa governorate. JICA						
15. Build new pump station building at Al zarqa Aljadeedah and transfer pumps from old building to new one. After that, improve electrical power consumption in this pump station. JICA				**Finished**		
16. Improve efficiency in pump station located in Al Zarqa governorate. JICA				**Finished**		
17. Rehabilitation Lib and Wala Pump Stations in MADABA governorates	Miyahuna Company	**Stage 1: Replacing 8 Surface Pumps**	1. Annual Water Pumped (m^3/year)	13,140,000		13,140,000
				1,500 (m^3/ Hr)		1,500 (m^3/ Hr)
			2. Electrical Power consumption (kWH/year)	Wala	5,533,976	4,882,944
				Lib	5,913,656	4,408,368

				Sum	11,447,632	9,291,312
			3. Annual Electrical Power Saving (kWH/ Year)	2,156,320		
Program 2: Rehabilitation of water distribution networks						
Measures/Actions: **Simulate existing network, compare demand and supply, find high pressure points, Pinpoint valves fitting and pipe needed to be replaced** **Replace direct pumping by Increased reliance on natural flow in the water supply networks.**						
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**		**Project Target**
1. a water improvement project of the capital Amman / first stage	Miyahuna	create a master reservoir to receive water in Abu Alanda	savings in electrical energy consumption			19807895 kWh= about 1.7 million JD at 0.087 JD/kwh (2014 tariff)
2. Rehabilitation of Al Zarqa water Distribution network PS						
3. Rehabilitation Zay Pump Stations						
4. Amman water network Rehabilitation Project						
5.Ein Albasha and Safoot water network Rehabilitation Project						
6. Mahes water network Rehabilitation Project						
7. Al salt water network Rehabilitation Project						
8. Jarash Swoof water network Rehabilitation Project						
9. Altaybeh water network Rehabilitation Project						
10. Karak Al-Mazar water network Rehabilitation Project						
11. Ajloon water network Rehabilitation Project						

12. Build a new water Supply network in AL Zarqa Aljadeedeh Area. JICA					
13. Install Valves and Air release valve in water distribution Network at AL Zarqa governorate. JICA					
14 Replace two pumps and one more at Zay Pump station in addition to valve and non-return valves to supply and discharge lines.					4,953,788 kWh/ year 435,000 JOD/ year
Program 3: Optimization of the water facilities Operation and Maintenance					
Measures/Actions:					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**
1. Wastewater trunk line from West AL Zarqa to Alkherbeh Alsamrah			Conveyed water (Million m^3/ Year)	0	40
			Energy Saving (GWH/Year)	0	7
2. Operation of Lib and Wala Pump Stations in MADABA governorates	Miyahuna Company	**Stage 2: Wala and Lib pump station Operation for 4 years**	1. Annual Water Pumped (m^3/year)	13,140,000	13,140,000
			Energy Saving (GWH/Year)	0	6.3
Program 4: Administrative Expenses					
Measures/Actions:					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**

Mid-Term Actions					
Program 1: Rehabilitation of Water Fields and Pumping stations					
Measures/Actions:					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**
Program 2: Rehabilitation of water distribution networks					
Measures/Actions: Supply and installation of pumps, electrical motor and new pipes. Also installation of the following: A. Raiser pipes. B. Suction and discharge pipes, C. Valves, D. Pumps, Transformers. , E. Earthing system, F. Panels, G. Cables.					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**
Program 3: Optimization of the water facilities Operation and Maintenance					
Measures/Actions:					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**
Program 4: Administrative Expenses					
Measures/Actions:					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**

Long Term Actions

Program 1: Rehabilitation of Water Fields and Pumping stations					
Measures/Actions:					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**
Program 2: Rehabilitation of water distribution networks					
Measures/Actions: Supply and installation of pumps, electrical motor and new pipes. Also installation of the following: A. Raiser pipes. B. Suction and discharge pipes, C. Valves, D. Pumps, Transformers. , E. Earthing system, F. Panels, G. Cables.					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**
Program 3: Optimization of the water facilities Operation and Maintenance					
Measures/Actions:					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**
Program 4: Administrative Expenses					
Measures/Actions:					
Project	**Responsible party**	**Sub-Projects**	**KPIs**	**Project Base Line**	**Project Target**

B) Renewable Energy Action Plan

Short Term Actions

Program 1: Solar Energy Systems for Administrative Buildings of Water Sector

Measures/Actions: Installation of Photovoltaic systems on the roof top or near the administrative buildings of the water sector, e.g. ministry, water companies and water facilities buildings

Project	Location	Size (kWp)	Responsible party	KPIs	Project Base Line	Project Target
1. WAJ Roof-top PV system	Amman	240		Power Generation (MW/year)	0	400
				Monetary Saving (JOD/ year)	0	100,000

Program 2: Utilization of Hydro Power Potential to power the Water Sector

Measures/Actions: construction of hydropower stations in water facilities, e.g. dams, to generate power for the water sector

Project	Location	Size	Responsible party	KPIs	Project Base Line	Project saving Target
1. Alkherbeh Alsamrah Project Phase I (2014)	Al Zarqa	53 MWh/day	Sepco	Total plant Power Consumption (MWh/ Year)	63,510	-19,345
				Power Saving (%)	0	30%
				Monetary Saving (JOD/Year)	0	3,842,355
2. Alkherbeh Alsamrah Project Phase II (2015)	Al Zarqa	65 MWh/day	Sepco	Total plant Power Consumption (MWh/ Year)	98,915	-23,725
				Power Saving (%)	0	24%
				Monetary Saving (JOD/Year)	0	2,064,000

3. Abu Alanda Reservoir to Khaw Reservoir Water Transmission Pipeline		30 Million m^3/ Year		Conveyed water (Million m^3/ Year)	0	30
		16 GWH/Year		Power Generation (GWH/ Year)	0	16
4. King TalaL Dam		6 MW		Power Generation (KWh/ Year)		15,000,000
Program 3: Utilization of biofuel potential in wastewater facilities						
Measures/Actions: Utilization of wastewater treatment plants sludge to produce Bio-gas for facility power generation						
Project	**Location**	**Size**	**Responsible party**	**KPIs**	**Project Base Line**	**Project saving Target**
1. Alkherbeh Alsamrah bio-gas project Phase I (2014)	AL Zarqa	101 MWh/day		Total plant Power Consumption (MWh/ Year)	63,510	-36,865
				Power Saving (%)	0	58%
				Monetary Saving (JOD/year)		3,207,255
2. Alkherbeh Alsamrah bio-gas project Phase II (2015)	AL Zarqa	154 MWh/day		Total plant Power Consumption (MWh/ Year)	98,915	-56,210
				Power Saving (%)	0	57%
				Monetary Saving (JOD/Year)	0	4,890,270
3. Construction at a mono Land fill at Asamra Wastewater Treatment Plant (2015-2016)	AL Zarqa	4 GWH/Year		Power Generation (GWH/Year	0	4
4. Climate Change in the Wastewater Sector (Add Dates)		7GWH/Year		Power Generation (GWH/Year)	0	7
Mid-Term Actions						
Program 1: Solar Energy Systems for Administrative Buildings of Water Sector						
Measures/Actions: Installation of Photovoltaic systems on the roof top or near the administrative buildings of the water sector, e.g. ministry, water companies and water facilities buildings						
Project	**Location**	**Size (kWp)**	**Responsible party**	**KPIs**	**Project Base Line**	**Project Target**
1. The water testing and Quality Building PV system	Amman	350		Power Generation (MWh/year)	0	580

				Power Saving (%)	0	100
				Monetary Saving (JOD)	0	140,000
2. The Storage and workshop Building PV System	Amman			Power Saving (%)	0	
				Monetary Saving (JOD)	0	
Program 2: Utilization of Hydro Power Potential to power the Water Sector						
Measures/Actions: construction of hydropower stations in water facilities, e.g. dams, to generate power for the water sector						
Project	**Location**	**Size (kWh)**	**Responsible party**	**KPIs**	**Project Base Line**	**Project Target**
Program 3: Utilaization of biofuel potential in wastewater facilities						
Measures/Actions: Utilization of wastewater treatment plants sludge to produce Bio-gas for facility power generation						
Project	**Location**	**Size (kWp)**	**Responsible party**	**KPIs**	**Project Base Line**	**Project Target**
Program 4: large scale Renewable Energy Based Power Generation For Water Sector (on Available Lands)						
Measures/Actions: Construction of On-site Renewable Energy Systems for large water pumping stations (Net-metering) on lands adjusted to the water facility						
Project	**Location**	**Size (MWp)**	**Responsible party**	**KPIs**	**Project Base Line**	**Project Target**
1. Wadi Al Arab Station (on available lands)		5		Power Saving (%)	0	
				Monetary Saving (JOD	0	
2. Al Zaatari Station (on available lands)	Al Zaatari Station	5		Power Saving (%)	0	
				Monetary Saving (JOD	0	
3. Zara Ma'in Station (on	WTP and	7		Power Generation (GWh)	0	13.86

available lands)	surrounding area			Monetary Saving (JOD)	0	1,400,000
Program 5 large scale Renewable Energy Based Power Generation For Water Sector (Wheeling)						
Measures/Actions: Construction of Renewable Energy Systems for large water pumping stations on lands adjusted to the water facility (Net-metering) and in remote areas according to wheeling scheme						
Project	**Location**	**Size (MWp)**	**Responsible party**	**KPIs**	**Project Base Line**	**Project Target**
Wheeling PV Project		50	BOO	Power Saving (%)		
				Monetary Saving (JOD)		

Long Term Actions						
Program 1: Solar Energy Systems for Administrative Buildings of Water Sector						
Measures/Actions: Installation of Photovoltaic systems on the roof top or near the administrative buildings of the water sector, e.g. ministry, water companies and water facilities buildings						
Project	**Location**	**Size (kWp)**	**Responsible party**	**KPIs**	**Project Base Line**	**Project Target**
Program 2: Utilization of Hydro Power Potential to power the Water Sector						
Measures/Actions: construction of of hydropower stations in water facilities, e.g. dams, to generate power for the water sector						
Project	**Location**	**Size (kWp)**	**Responsible party**	**KPIs**	**Project Base Line**	**Project Target**
1. Implement water turbine on Aldisi trunk line.						
2. Implement water turbine on Ras Al-Ain trunk line.						
Program 3: Utilization of biofuel potential in wastewater facilities						
Measures/Actions: Utilization of wastewater treatment plants sludge to produce Bio-gas for facility power generation						

Project	Location	Size (kWp)	Responsible party	KPIs	Project Base Line	Project Target
Program 4: large scale Renewable Energy Based Power Generation For Water Sector (Wheeling)						
Measures/Actions: Construction of Renewable Energy Systems for large water pumping stations on lands adjusted to the water facility (Net-metering) and in remote areas according to wheeling scheme						
Project	**Location**	**Size (MWp)**	**Responsible party**	**KPIs**	**Project Base Line**	**Project Target**
Wheeling PV Project to supply various water PS	not defined	100		Power Saving (%)	0	
				Monetary Saving (JOD)	0	