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Mobilizing Electricity Companies to Implement Energy Efficiency

USAID Jordan Energy Sector Capacity Building Activity
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Training Workshop on “Electricity Efficiency in Generation,
Transmission and Distribution”
4-5 September 2016





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- Jordan's Energy Crisis and Energy Policy Response
- What is DSM?
- Why involve electricity companies in energy efficiency?
- What kind of framework is needed to promote DSM?
- Jordan's DSM program design
- Economics of a DSM program
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Jordan's energy sector faces multiple challenges

Rapidly growing energy demand



- 7% annual growth in primary energy demand
- 6 % annual growth in electricity demand

Near total dependency on imported fuels



- 97% of energy needs met through imports
- 10% of GDP annual spending on energy imports (2015)

Large subsidy flows for household electricity consumption



- \$400 million spent in 2015 on electricity subsidies

Mobilizing the investment to expand energy resources



- New supplies (conventional and renewable)
- Transmission additions



What is Demand-Side Management (DSM)?

Energy-saving activities delivered by energy utilities to their customers

DSM measures include:

- Advice and assistance
- Promoting energy-saving behavior
- Incentives to invest in energy-saving measures
- On-bill financing
- Procurement and distribution of energy-saving technologies

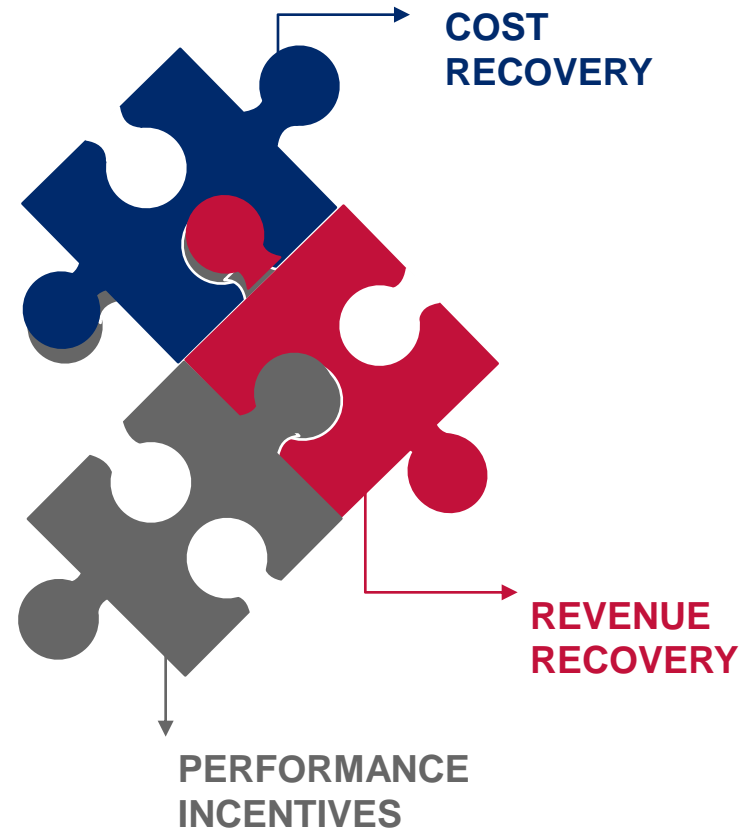
Who benefits from DSM?

- Energy consumers, through lower energy bills
- Utilities and governments, through reduced energy investment needs and lower subsidy flows
- Local communities and businesses, through economic development
- Society, through lower GHG emissions



DSM has proven effective in the U.S. and globally

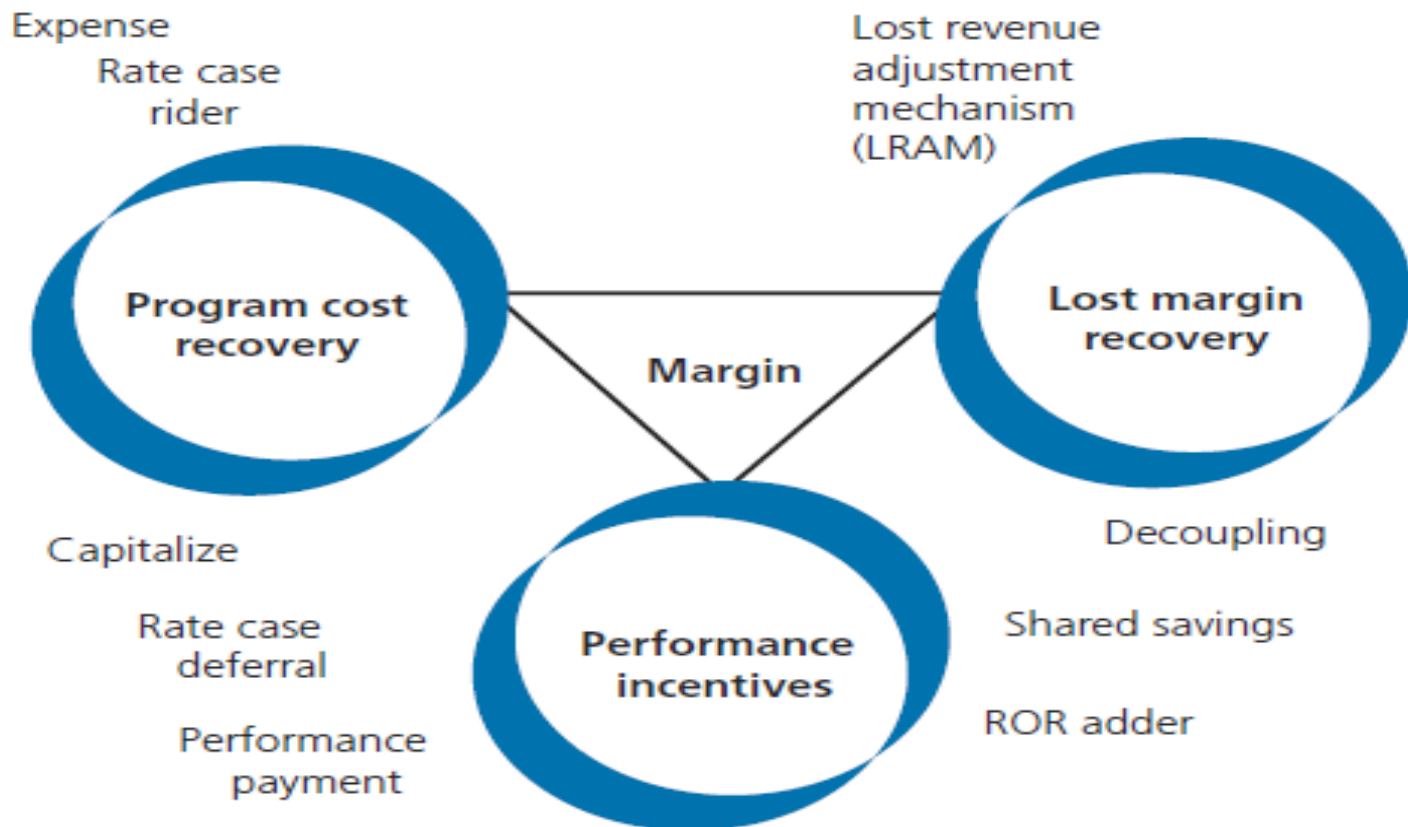
- DSM accounts for about 15% of annual energy-savings in the US¹
- DSM spending is funded through utility bills
- Utilities must be able to recover their costs and lost revenues
- Incentive payments encourage utilities to meet their energy-saving targets
- A regulatory and legal framework is required
- DSM programs can deliver up to 3-5% annual savings on a long-term basis



¹IEA 2014 US In-Depth Policy Review



Minimum requirements for utility participation in DSM





Global DSM/EE spending by energy utilities

Region	Energy Revenues (USD Billions)	2011 EE Spending (USD Millions)	Spending metric (%)
North America ¹	400	7,800	1.9
EU 28 ²	650	2,500	0.4
Australia	25	90	0.35
Brazil	50	25	0.5
China	410	N/A	N/A

¹ Electricity only

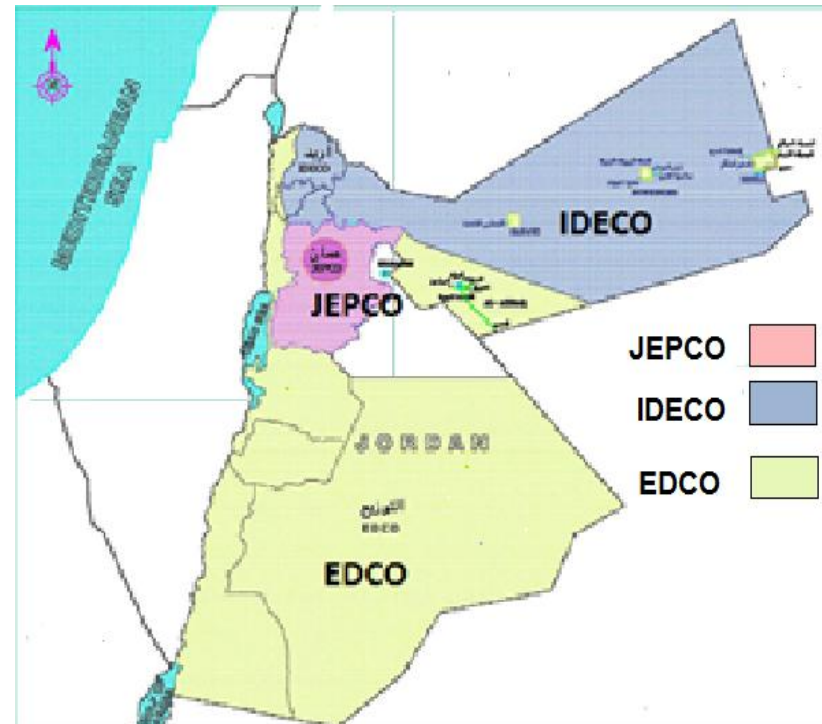
² Gas and electricity

Sources: Lees 2012; Crossley & Swanson 2011; Faruqi 2011; Heffner 2012



Jordan's electricity distribution companies are well positioned to promote energy saving

- Strong technical and administrative capacity
- Billing data needed to segment markets and qualify customers
- Access to financing
- Familiarity and branding
- Complete geographic coverage
- Well-placed to overcome the low-awareness and risk-aversion of end-users





Distributor DSM Models

1. Distributor is an **Energy Services Provider**, delivering energy savings. Regulator may set targets, fees, incentives, penalties, and require evaluation requirements.

2. Distributor **adds DSM/EE investments to its rate base**, with its return on equity recovered through tariffs

3. Distributor **facilitates development of EE projects**, recovering program costs and a success fee through tariffs or an external fund

4. Standard Offer/feed-in tariff mechanism: third parties compete to develop DSM/EE projects. Distributor **manages the Standard Offer**; Regulator sets targets and provides oversight.

5. Distributor **procures EE equipment and provides to customers on a credit-repayment basis**, earning a profit. Regulator may or may not provide oversight.

6. Distributors **are obliged to meet energy savings** targets set by the regulator. The regulator imposes a penalty for non-compliance



DSM incentive mechanisms around the world

Country	Energy utilities covered	DSM/EE mechanism	Customers covered
France	Energy retailers including oil companies	Savings obligation	All except large industry
Italy	Energy distributors	Savings obligation + White Certificates	All
UK	Energy retailers	CO2 reduction target	Residential with low-income set-aside
Denmark	Energy distributors	Savings obligation	All except transport
Australia	Energy retailers	Savings obligation	Varies by state
US	Energy distributors and retailers	EE resource standards + shareholder incentives	All
Canada	Energy distributors	EE resource standards	All
Brazil	Electricity distributors	EE spending obligation	All, with set-aside for low-income households
China	Municipal power companies	DSM resource standard	All



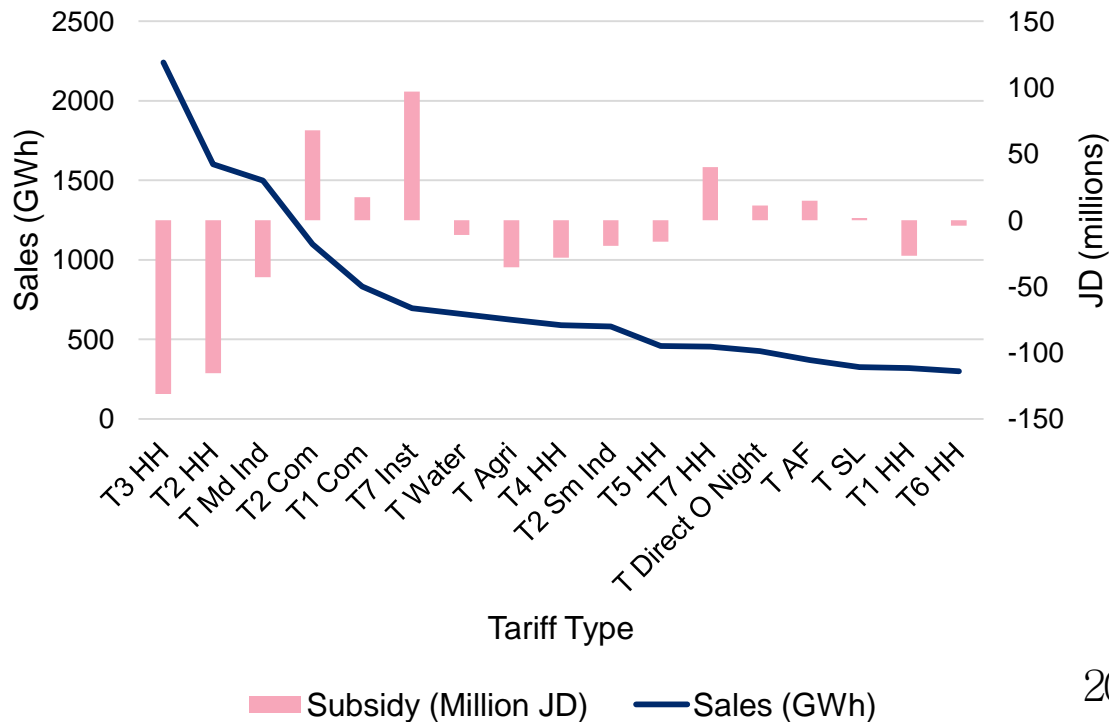
Mobilizing DSM mechanisms to meet economic objectives

Economic objectives	DSM mechanism	Examples
Minimize energy subsidies to consumers	DSM programs focused on subsidized consumers	India, Indonesia, Jordan
Control growth in energy demand growth	Energy and capacity savings targets for energy providers	Saudi Arabia, Indonesia
Improve reliability and avoid supply shortages	Energy and capacity reductions in response to system needs	South Asia, Africa, Asia, US
Managing commercial and network losses	Loss reduction savings targets	South Asia, Africa



Jordan's DSM program targets households receiving electricity subsidies

Sales vs. Contribution to Margin for Retail Tariff Classes



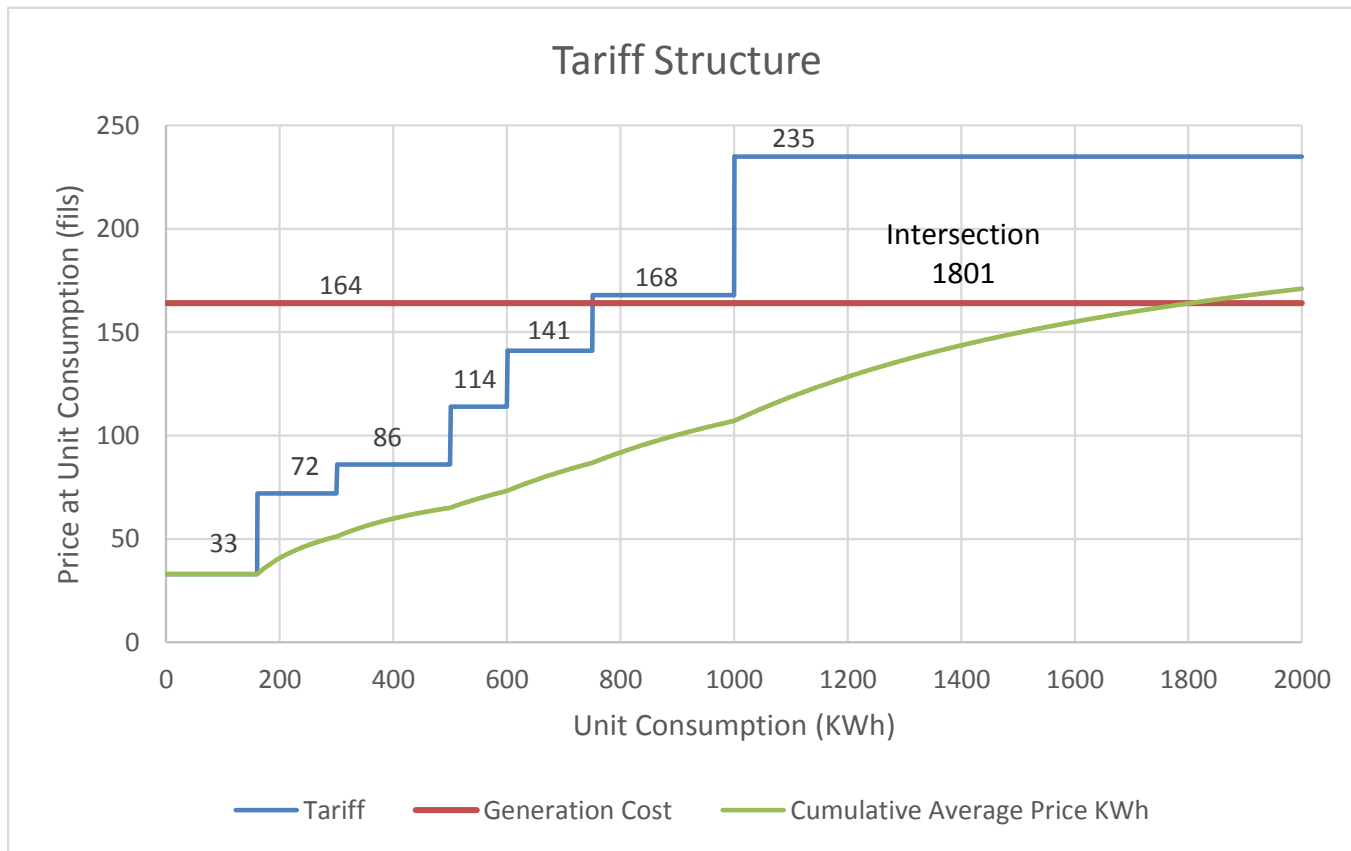
Jordan's challenges in serving the household sector

- 40% of total electricity used
- Fastest-growing sector
 - 75,000 new households annually
 - 7% annual growth
- Main recipient of energy subsidies
 - 400 million JD (2015)

2014 data



Jordan's tariff structure creates distinct market segments





Developing a DSM Incentive Mechanism in Jordan

Establishing a regulatory and legal framework

- DSM Recommendations adopted
- DSM Guidance issued by EMRC

DSM funding

- Through 2017: JREEEF revolving fund
- Post-2017: Tariff revenues



Tools to design and evaluate DSM programs

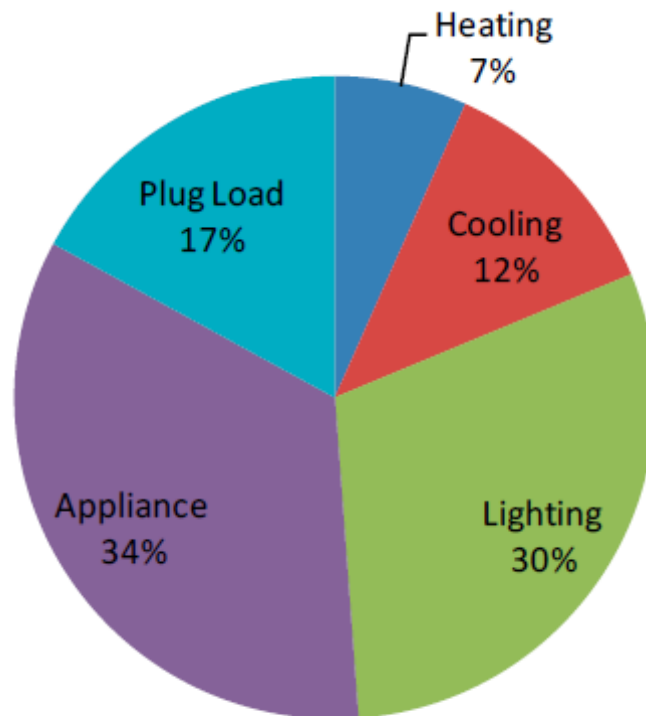
- DSM financial analysis model
- National household load survey

DSM capacity building

- DSM units at each electric utility
- Regulatory oversight procedures



Household end-use energy use in Jordan (1)





Household Load Survey Results – Lighting

84
PERCENT

of Jordanian homes have at least one compact fluorescent lamp

40
PERCENT

of Jordanian homes still have energy inefficient incandescent lamps

1.6
PERCENT

Hardly any Jordanian homes use energy efficient LED lighting

17
MILLION

Total CFLs, FTLs, and incandescent lamps in Jordanian homes, or 12 lamps per household

There is a major opportunity to replace Jordan's 17 million CFLs, FTLs, and incandescent lamps with energy efficient LEDs



Household Load Survey Results - Appliances

75
PERCENT

of Jordanians surveyed own one-door refrigerators ranging from 5-19 ft³

36
PERCENT

of refrigerators are more than 10 years old, which are less than half as efficient as today's models

98
PERCENT

of Jordanian homes own TVs, washing machines and refrigerators

1.4
MILLION

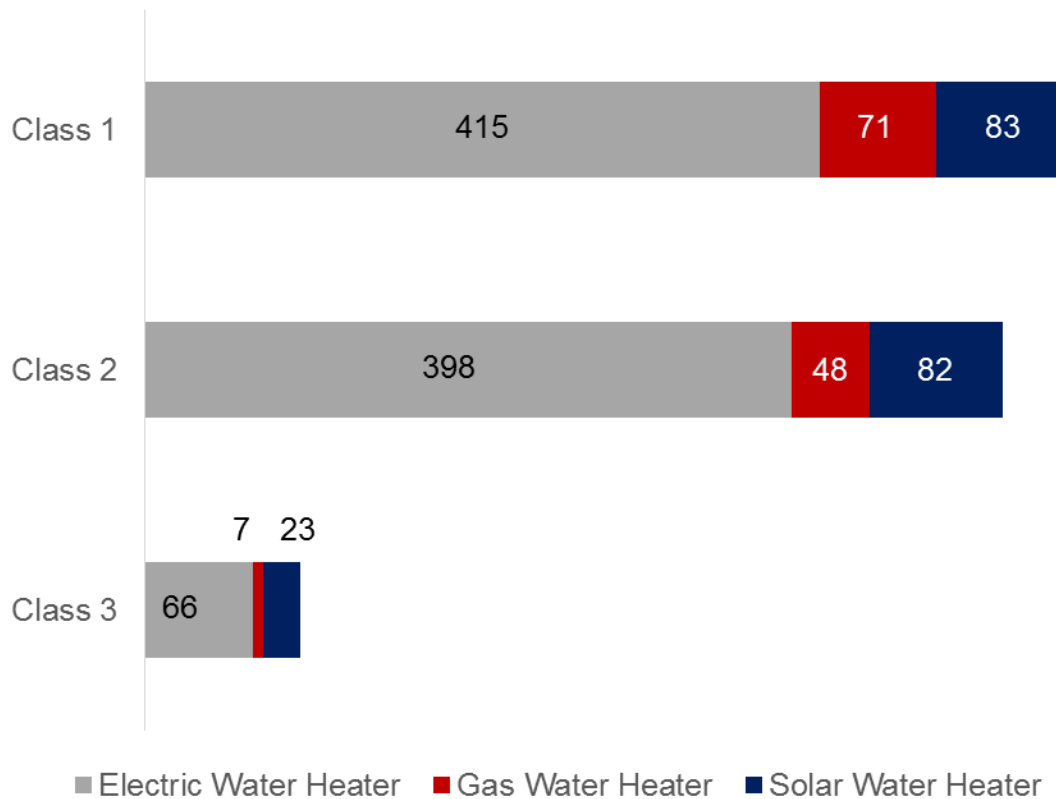
refrigerators in Jordanian households

There is a major opportunity to **replace old washing machines and refrigerators** with new energy efficient models



Household Load Survey Results – Water Heating

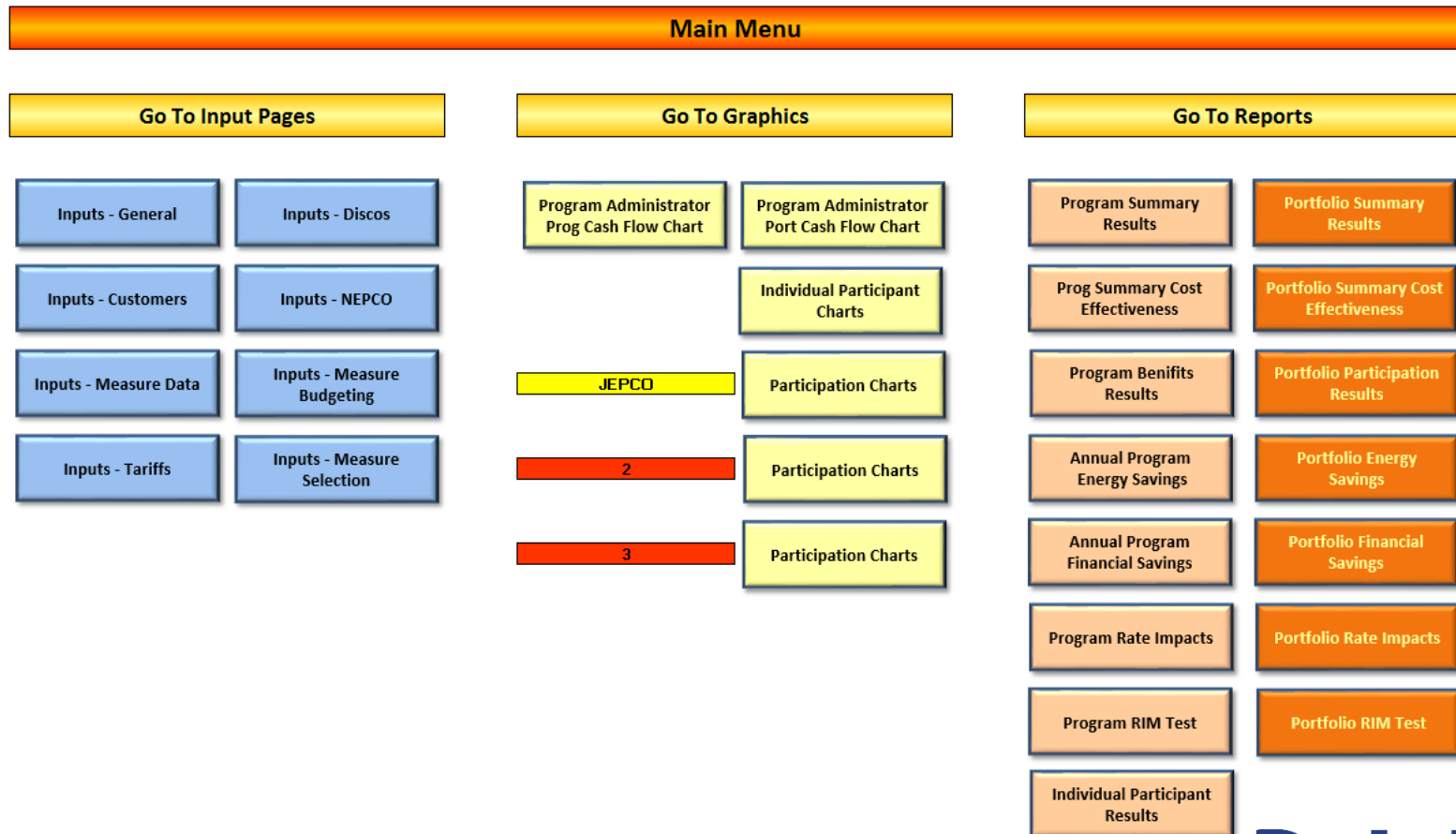
Household distribution for electric and/or solar water heaters



Most of the solar water heater market potential is for medium- and lower-usage households



DSM Financial Analysis Model





Costs and Benefits associated with DSM

	Benefits	Costs
Customer	<ul style="list-style-type: none">• Energy savings• Lower energy bills• More disposable income	<ul style="list-style-type: none">• Customer share of equipment purchase
Utility	<ul style="list-style-type: none">• Peak demand reduction• Reduced cost of electricity supply• Reduced losses• Reduced network congestion• Customer good will	<ul style="list-style-type: none">• Utility costs to procure & deliver• Distribution and marketing costs• Measurement & verification
GoJ	<ul style="list-style-type: none">• Reduced subsidy outlays• Lower energy bills for gov't buildings• Reduced spending on new supply	<ul style="list-style-type: none">• Incentive payments to customers• Incentive payments to the utility• DSM regulatory oversight costs• Measurement & verification



Example: Financial analysis of energy-saving lamps

Bulb Type	Incandescent	CFL	LED
Power Use	75W	22W	11W
Purchase Price	0.5JD	2 JD	4 JD
Life of the Bulb	1000 hours	10,000 hours	25,000 hours
Hours per Day	6 hours	6 hours	6 hours
Bulb lifetime	0.5 year	5 years	15 years
Annual bulb replacement Cost	1 JD	0.4JD	0.27JD
Annual Cost to participants (.033JD/kWh)	4JD	1 JD	
Annual cost to NEPCO (.1 JD/kWh)			
Total Cost over 1 year	5 JD	3 JD	
Simple Payback - Participant (years)	N/A	0.39	3.77
Simple Payback - NEPCO (years)	N/A	0.11	1.06



Step-by-step DSM program design

- Identify energy savings opportunities
 - By end-use
 - By customer class
- Estimate the potential benefits
 - For customers
 - For utilities
 - For NEPCO, government and regulators
- Develop the implementation approach
 - Specifications and testing needs
 - Procurement
 - Marketing and distribution
 - Measurement and evaluation
- Program cost estimation



DSM targets in Jordan

- 2016 DSM pilot projects:
 - 50,000 LED lamps for households
 - 1000 household SWHs
- 2017-2018 DSM pipeline:
 - Household refrigerator replacement
 - High-efficiency appliance rebates
 - Household PV
- 10-year DSM outlook:
 - Scale-up successful DSM projects with funding through tariffs
 - Goal: 1% annual household electricity savings and 10% reduction in subsidies



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Thank you!

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