IfaS

جامعة السلطان قابوس
Sultan Qaboos University

10th INTERNATIONAL CIRCULAR ECONOMY CONFERENCE

CE investment opportunities in the Energy Sector of Sultanate of Oman

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ENVIRONMENTAL CAMPUS BIRKENFELD

23rd October 2019

Outline

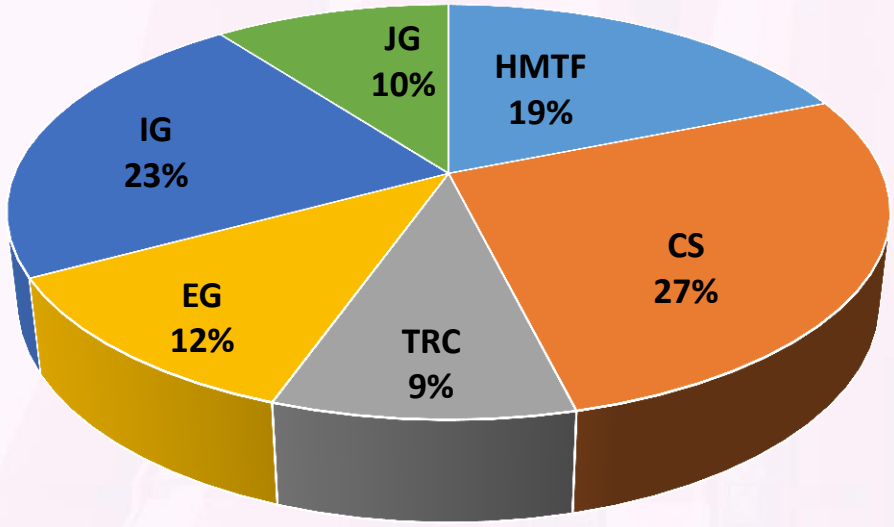
- Introduction, SQU and SERC
- Oman Electricity Sector
- Sustainability of Oman Energy Sector
- Renewable Energy is the Future
- Waste Management in Oman
- Waste to Energy
- SQU-SMC project
- Summary

SULTAN QABOOS UNIVERSITY


QS WORLD UNIVERSITY RANKINGS
“Among the Top 10 in the 2018 Arab Region Rankings”
SULTAN QABOOS UNIVERSITY

SULTAN QABOOS UNIVERSITY

- Population: 18,000 students, 6000 staff
- 9 Colleges, 13 Research Centers, and ITTC
- SQU Research Fund ~ **$7** M (annually)
- Six research funding schemes:
  - i. HM Trust Funds Grants
  - ii. Consultancy Services
  - iii. The Research Council Grants
  - iv. External Grants
  - v. Internal Grants
  - vi. Joints Grants



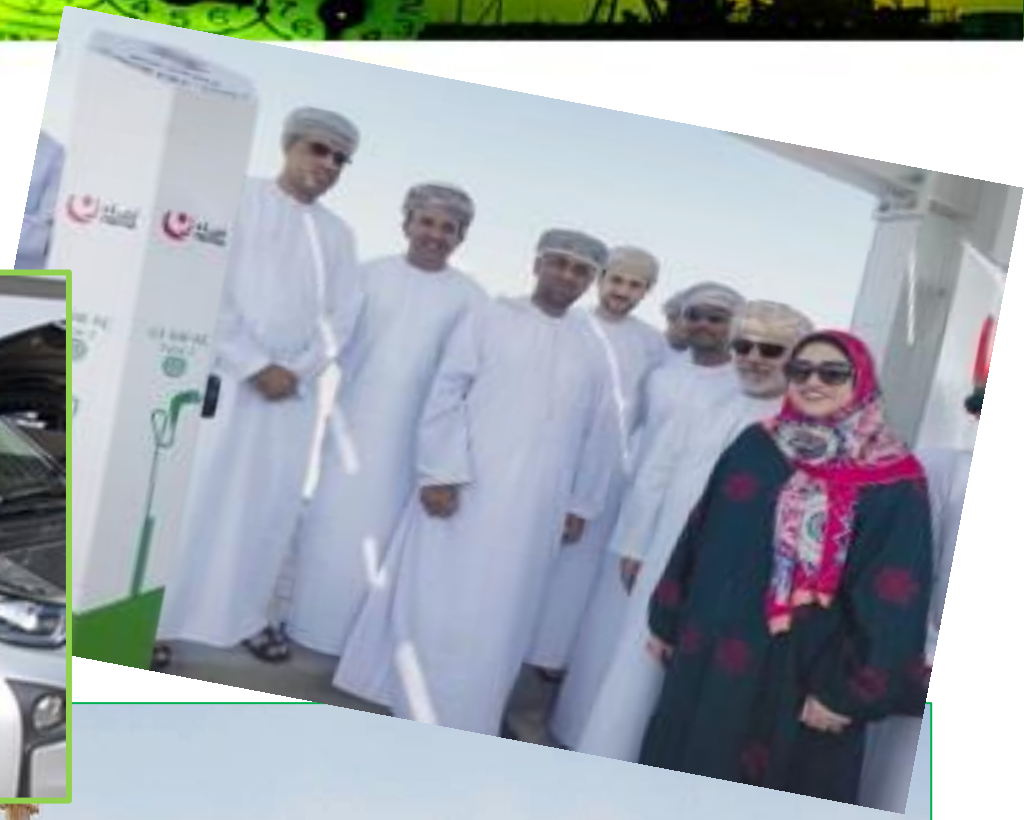
Sustainable Energy Research Center

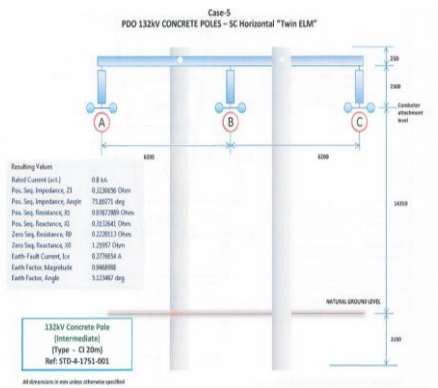
- Established on August 2017, **first research center in Oman dedicated for sustainable energy**
- Research theme: Renewable Energy, Integrated Electrical Energy Systems, Energy Efficiency and Management, Energy Policy and Strategies, hydrogen energy
- Total research funds since started: ~900k USD + 2.7M USD OXY grant
- Collaboration agreements: 4 local and international institutions
- Workshop: Design and Installation of a Grid-connected PV System Certified by DCRP
- Green Campus initiative: 4 projects within SQU campus

Research Projects

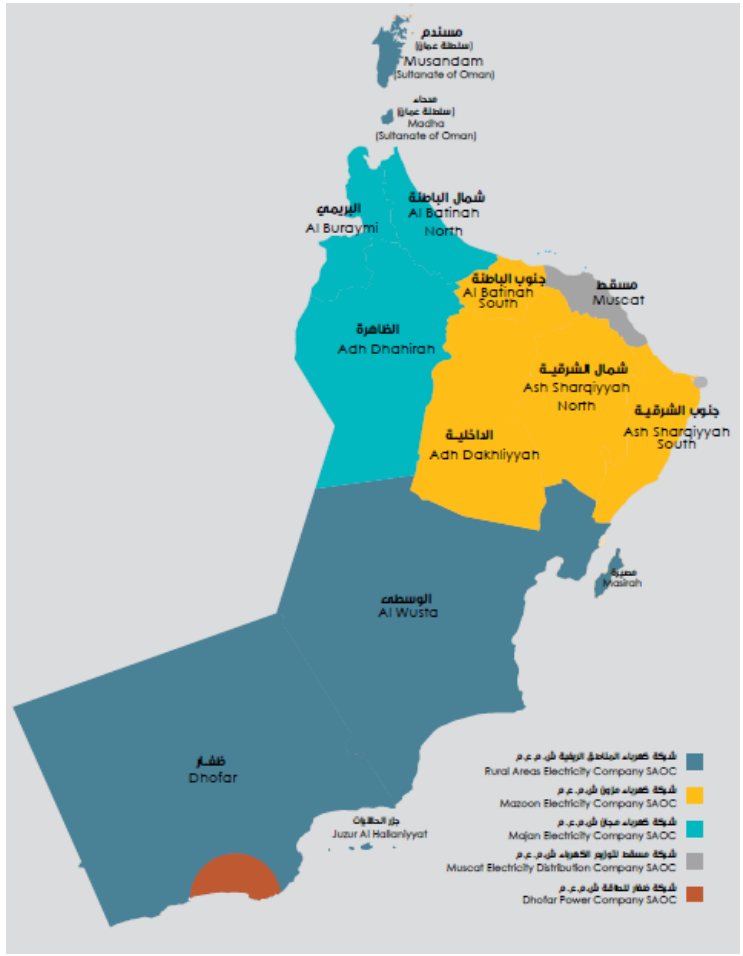
Project Title	Funding Source	USD
Evaluation of Utilizing Methanol Fuel for Electricity Generation in Oman, Application to Rural Areas and Remote Locations	SMC	272,000
Intelligent control design for Microgrid Inverters	SQU IG	17,500
PDO OHL Specification Update-Parallel Clearance between OHLs & Pipelines	PDO	59,000
An Offshore Wind Resource Assessment	BP – Grant (CESAR)	152,850
SQU Electric Vehicle Solar Charging Station	Nama/AlBahja/UPS	31,000
Impacts of Dust on PV systems Performance in Oman	SQU IG	38,860
Solar PV System Performance & Control	Nafath	51,800
Development of energy management system for dispatchable renewable power generation	HM Trust Fund (CoE)	168,400
Management of the Renewable energy Source in preparation for a SG in Oman	BP - Grant	77,720

Research Projects





Oman Electricity Sector

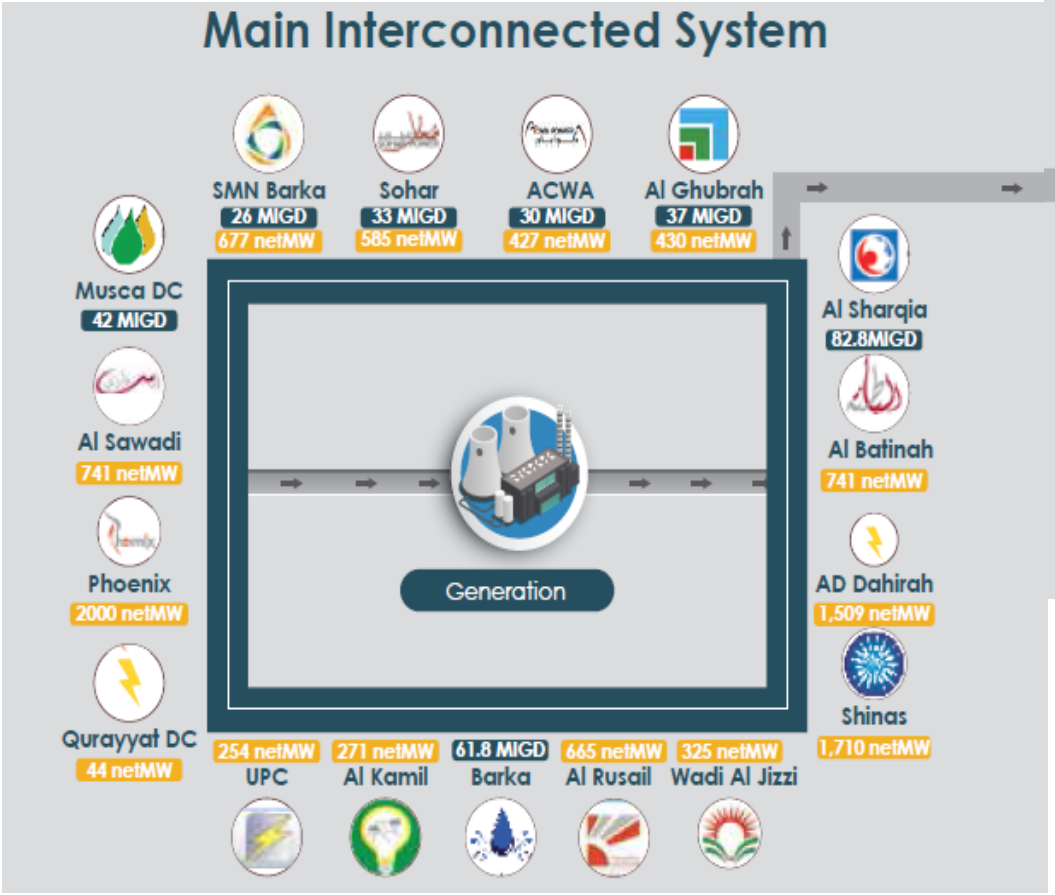


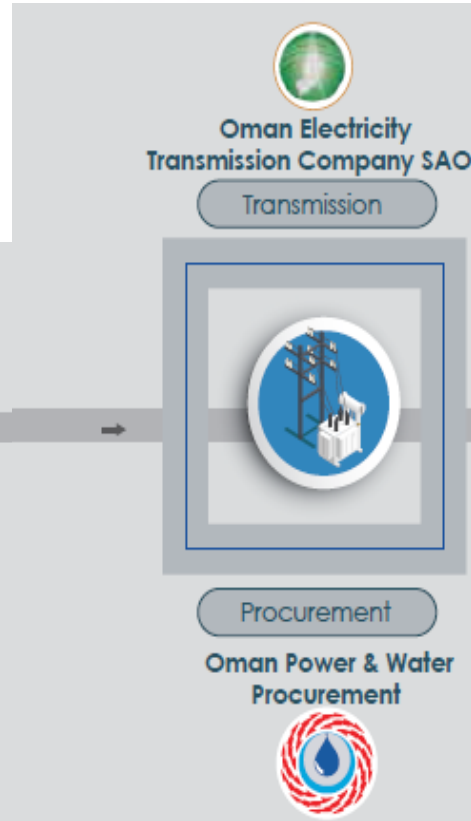
Area: 309,500 sq km
Population: ~ 4.7 millions

http://www.ncsi.gov.om/NCSI_website/

- The sector has been restructured by Royal Decree 78/2004, Unbundled from the MHEW
- Segregated into: Generation, Transmission, and Distribution & Supply
- Single Buyer Model: Oman Power and Water Procurement Company
- Independent Regulator: Authority for Electricity Regulation
- Restructuring helps in supporting the sector growth and improve the sector reliability and efficiency

Oman Electricity & Related Water Sector Structure





Main Interconnected System (MIS) ~ 88%
100% on natural gas

Rural Areas Electricity Company SAOC

69.4 MIGD
274 netMW

Generation

Bahwan Astonfield
303 kWp

Musandam
120 netMW

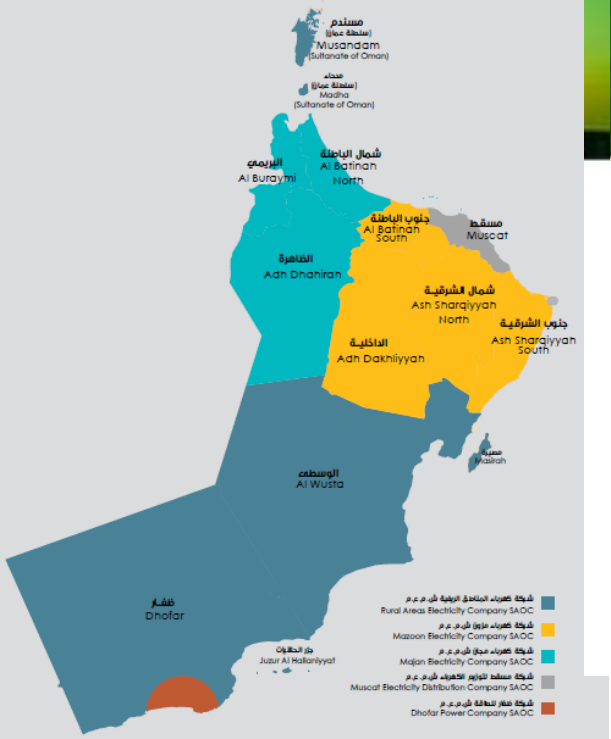
Rural Areas Electricity Company SAOC

Transmission

Distribu

Rural Systems ~ 3%

~90% on Diesel



Sembcorp Salalah

18 MIGD
445 netMW

Generation

Dhofar
273 netMW

Salalah
445 netMW

Oman Electricity Transmission Company SAOC

Transmission

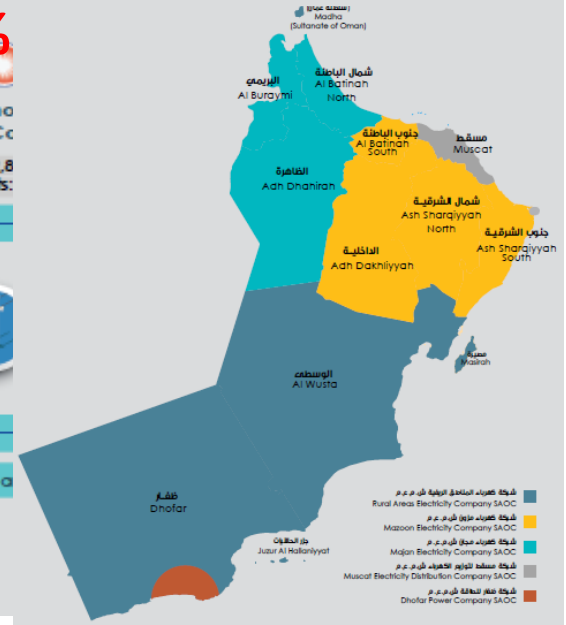
Procurement

Oman Power & Water Procurement

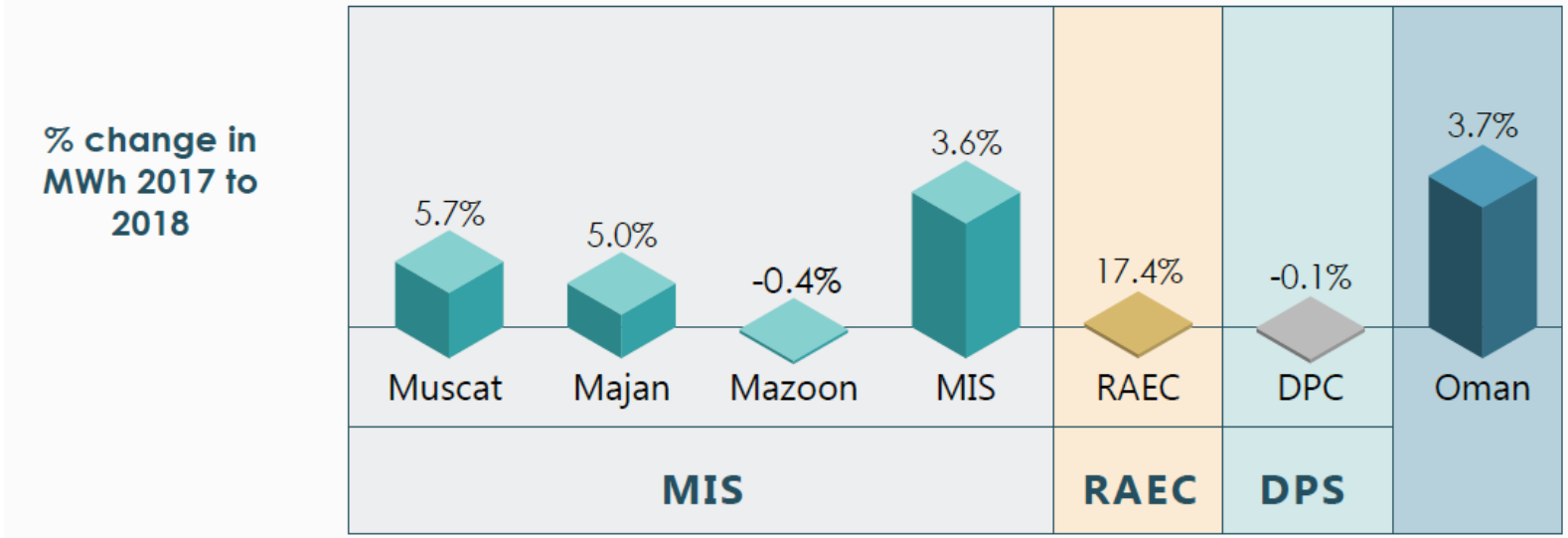
Distribution a

Dhofar Power System ~ 9%

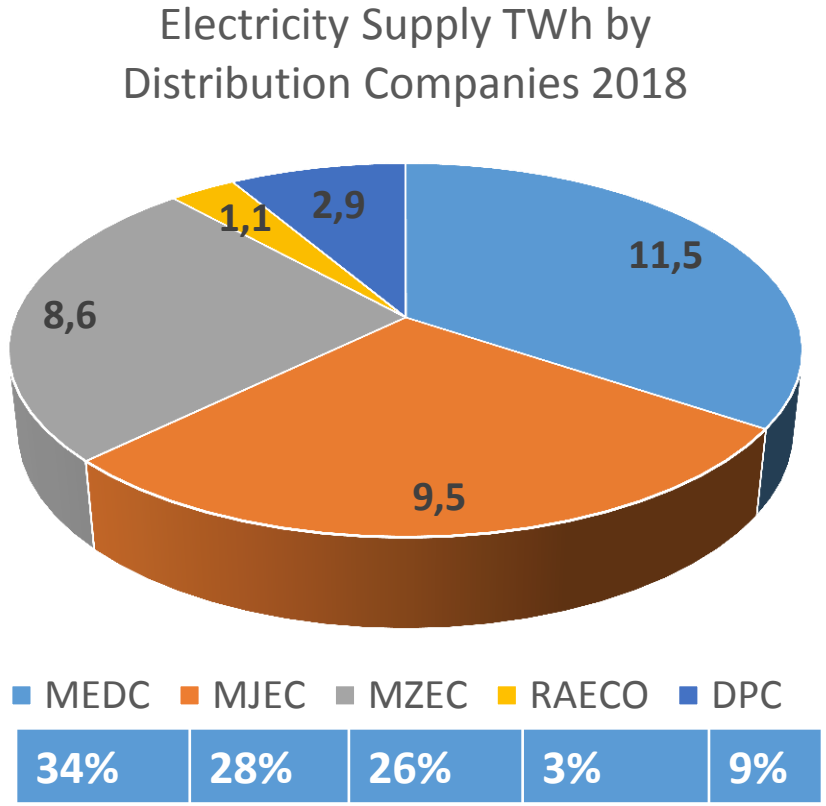
100% on natural gas



Distribution Companies Load Share

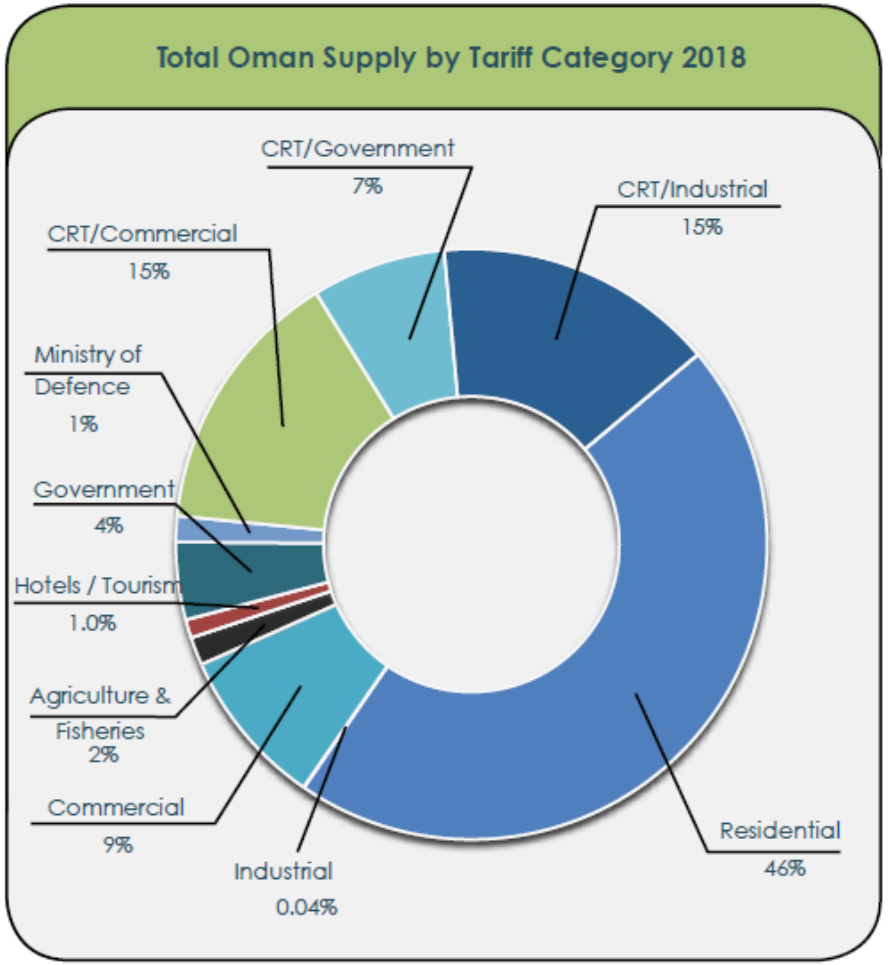


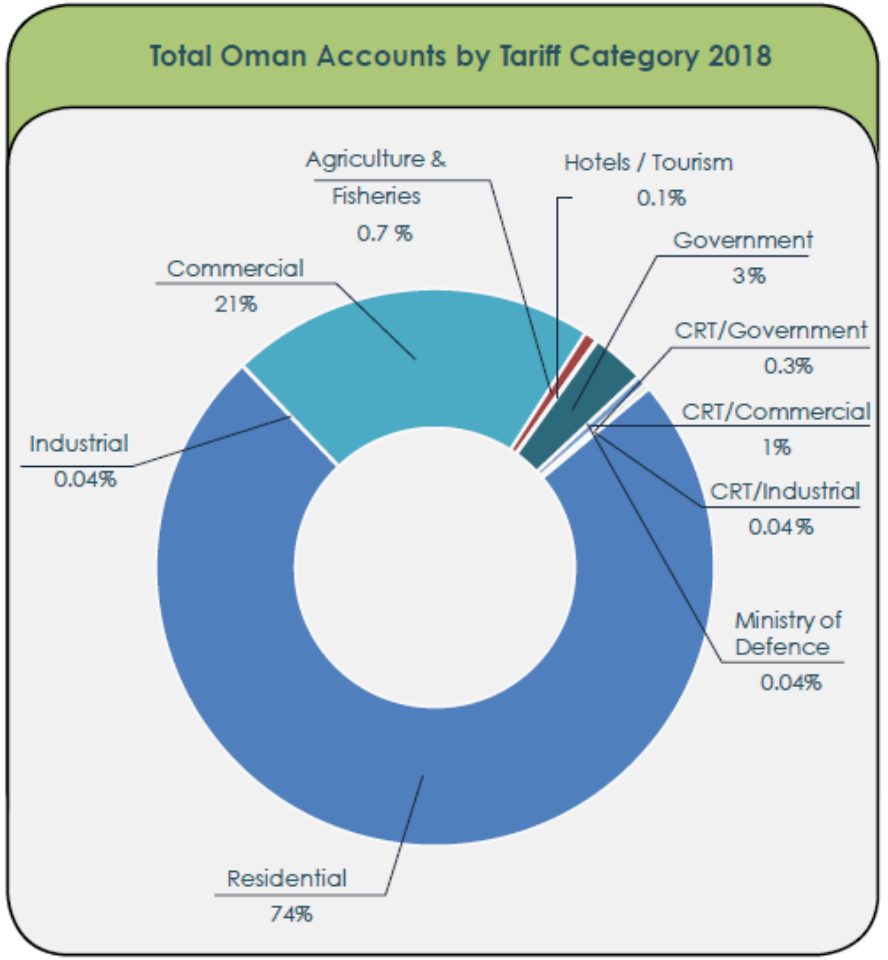
	Muscat	Majan	Mazoon	MIS	RAEC	DPC	Oman
MWh 2017	10,918,517	9,052,027	8,611,639	28,582,183	913,969	2,853,332	32,349,484
MWh 2018	11,538,036	9,507,184	8,578,761	29,623,982	1,072,950	2,850,557	33,547,489
% change in MWh	5.7%	5.0%	-0.4%	3.6%	17.4%	-0.1%	3.7%



Source: AER Annual report 2018

Electricity Supply - Oman 2018

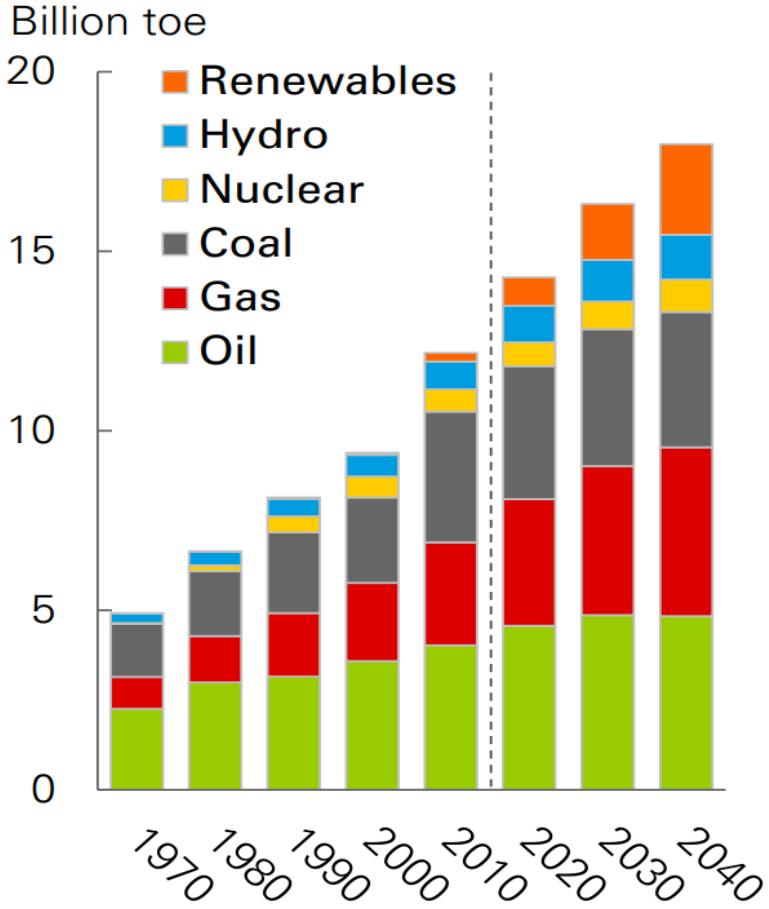




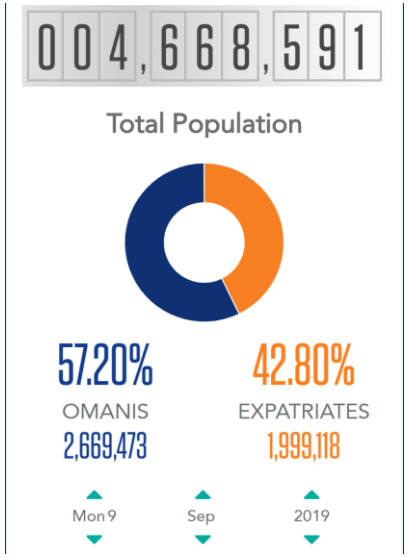
Source: AER 2018 Annual Report

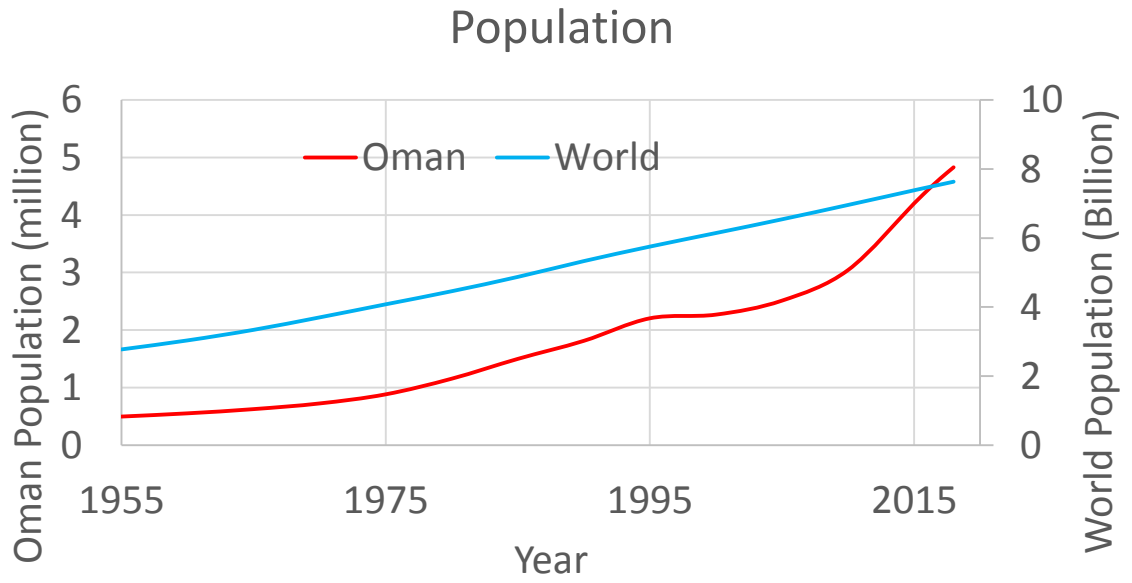
Challenge

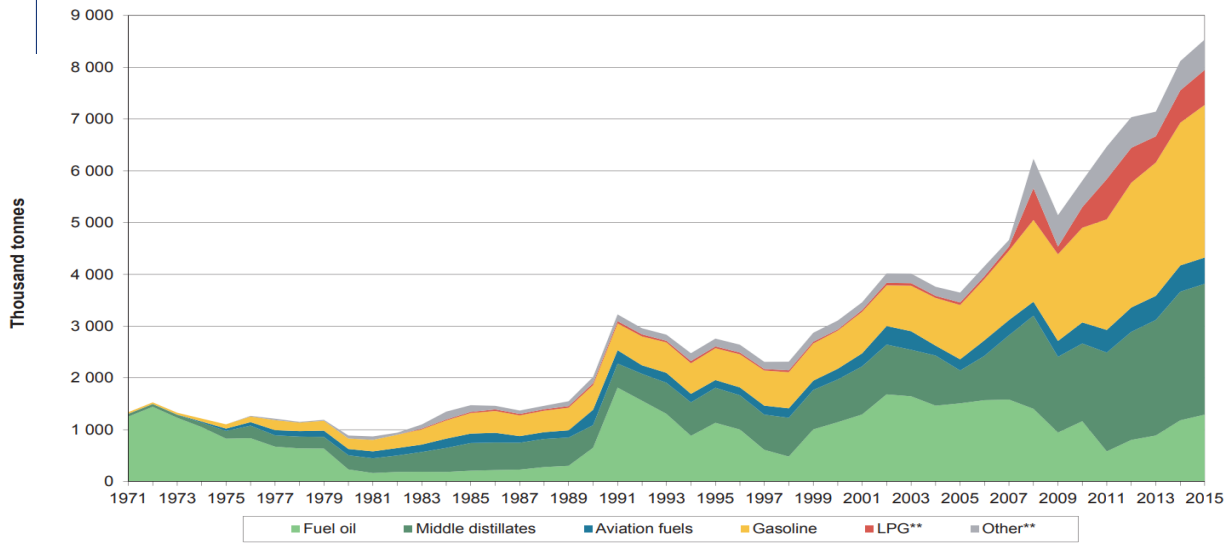
- Energy consumption continues to rise:
  - Population Growth
  - Economic Growth



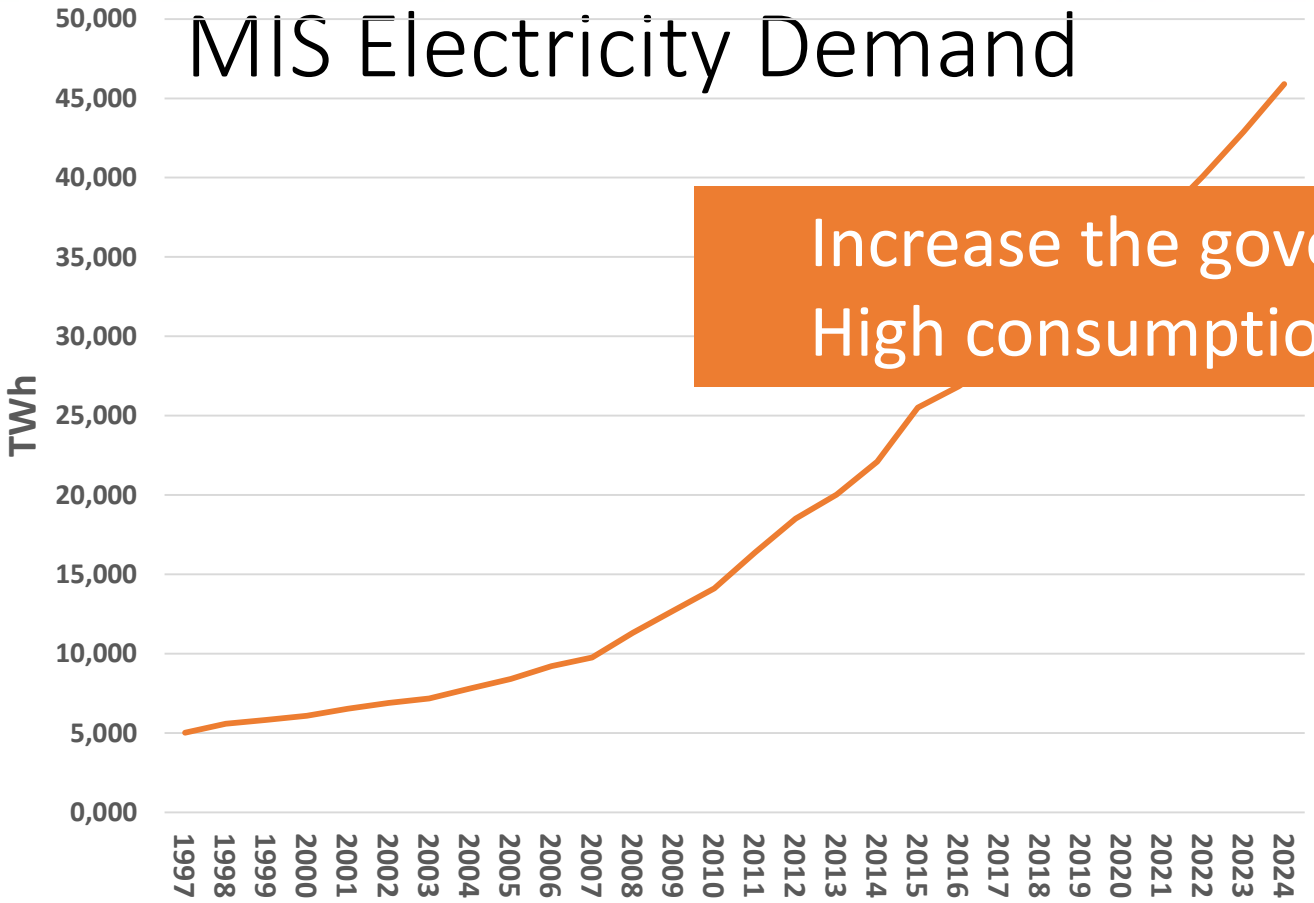
Source: BP Energy Outlook 2018



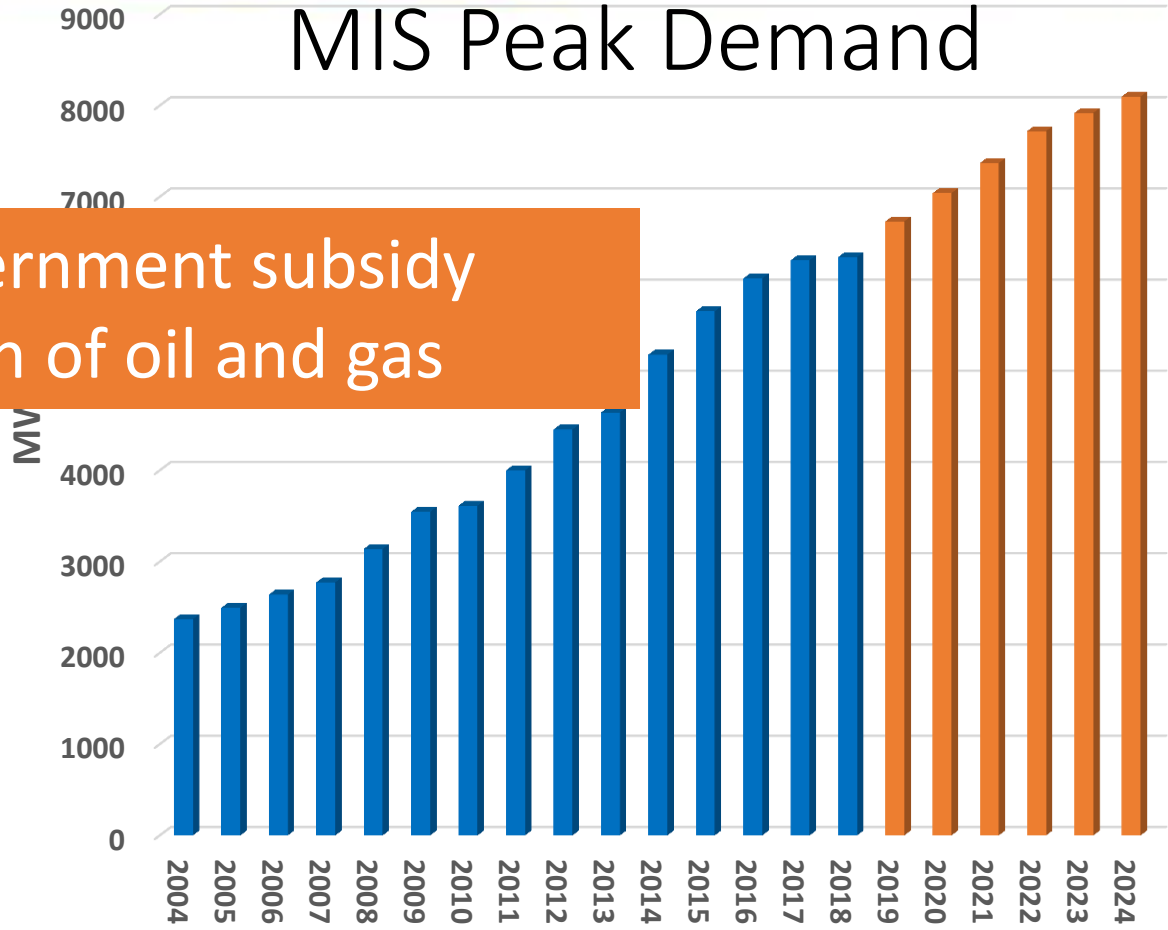




MIS Electricity Demand



MIS Peak Demand



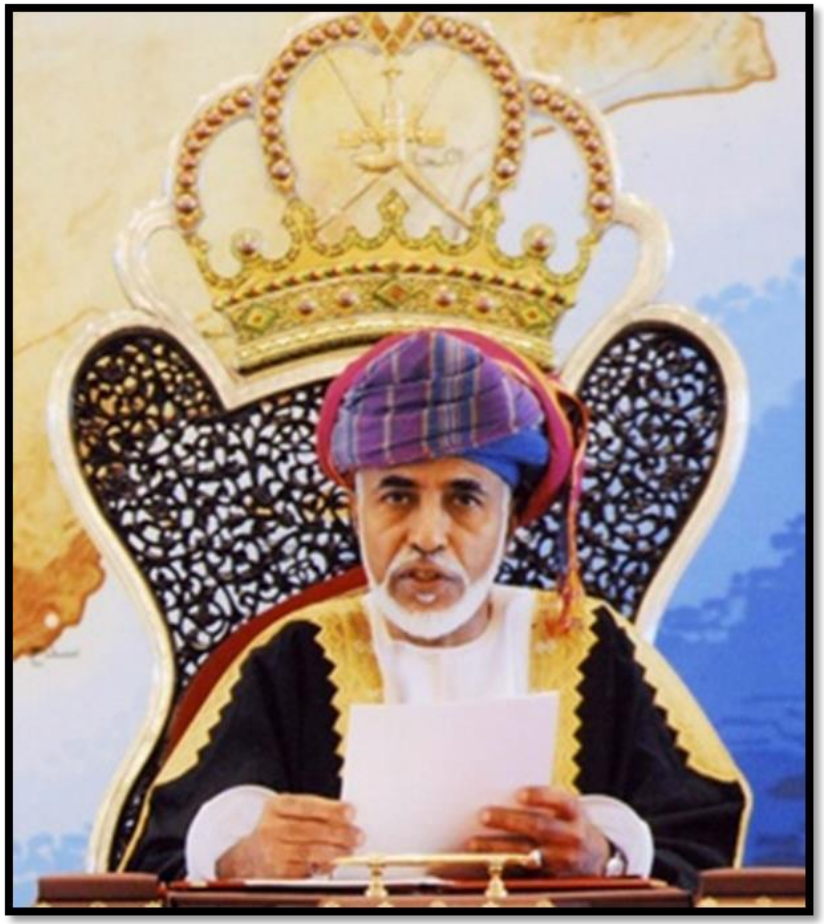
Increase the government subsidy
High consumption of oil and gas

Non-Sustainable Growth

Source: AER annual reports

Oman is Aware: HM Speech 2008

His Majesty Sultan Qaboos' Speech to the Council of Oman on 11 November 2008. "It is also necessary to look into ways of benefiting from alternative energy resources and to seek ways of achieving food security as much as possible."

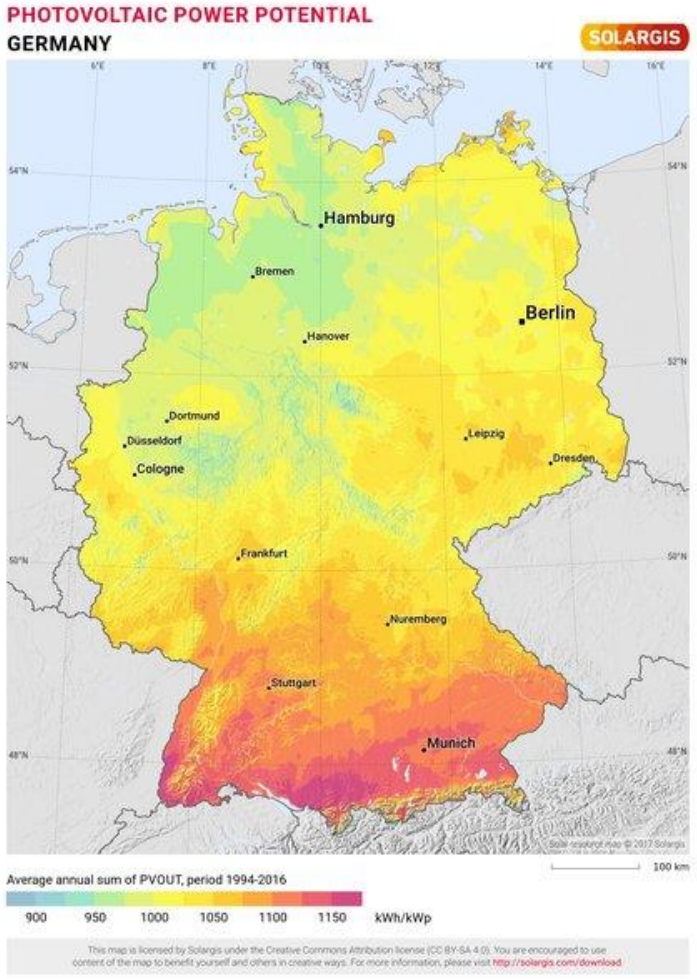


Renewable Energy Assessment Study in 2008

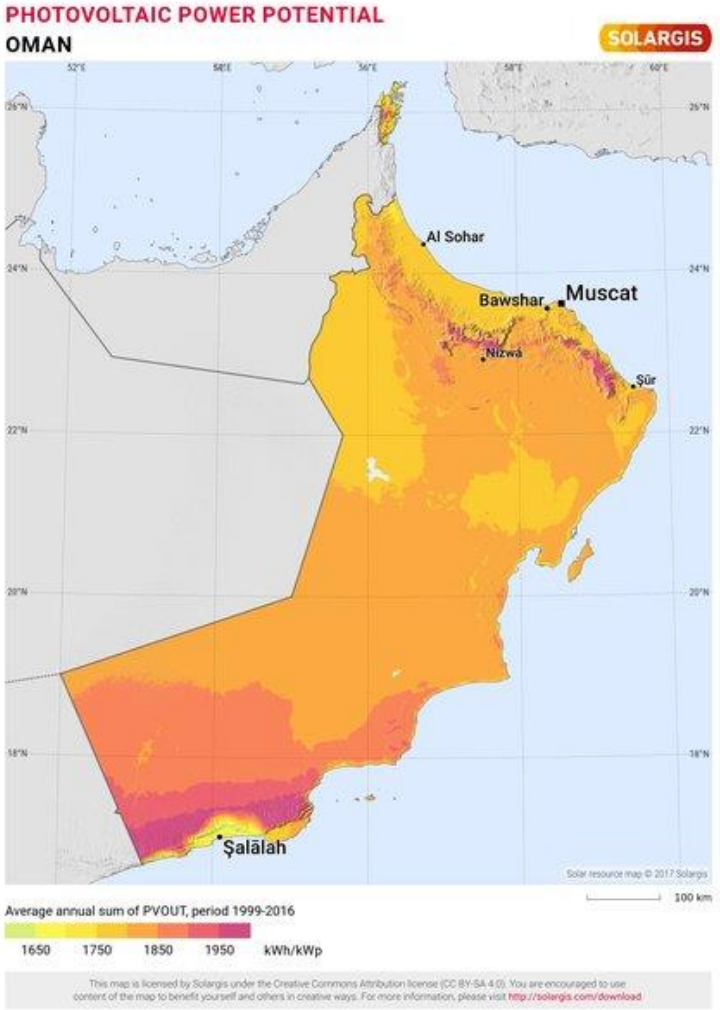
هيئة تنظيم الكهرباء - عمان
AUTHORITY FOR ELECTRICITY REGULATION, OMAN

- Solar density was found to be among the highest in the world and therefore significant scope for developing solar energy resources throughout Oman.
- Significant wind energy potential was found in the southern part of Oman.
- Solar and wind resources are to be utilized on a large scale
- Biogas, Geothermal and wave energy were all limited for electricity production, although may be feasible in the future

Let’s Compare with Germany



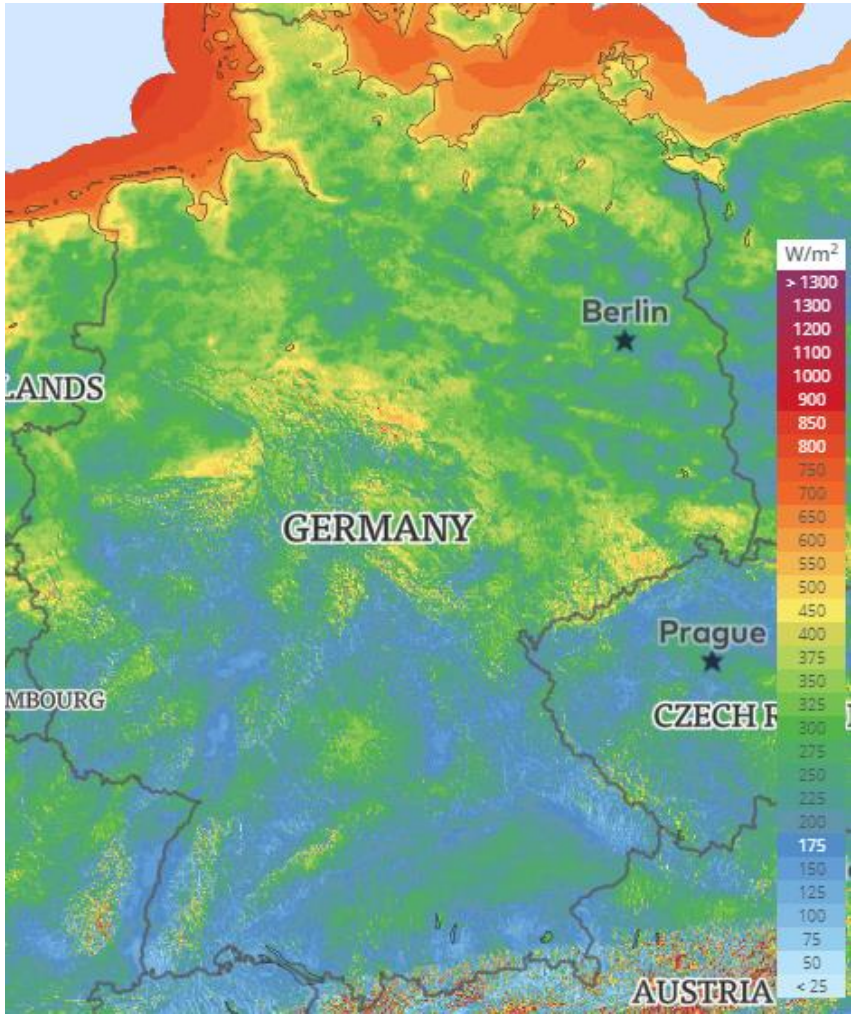
Potential: 2.6 to 3.2 GWh/kWp
Installed Capacity: 40 GW



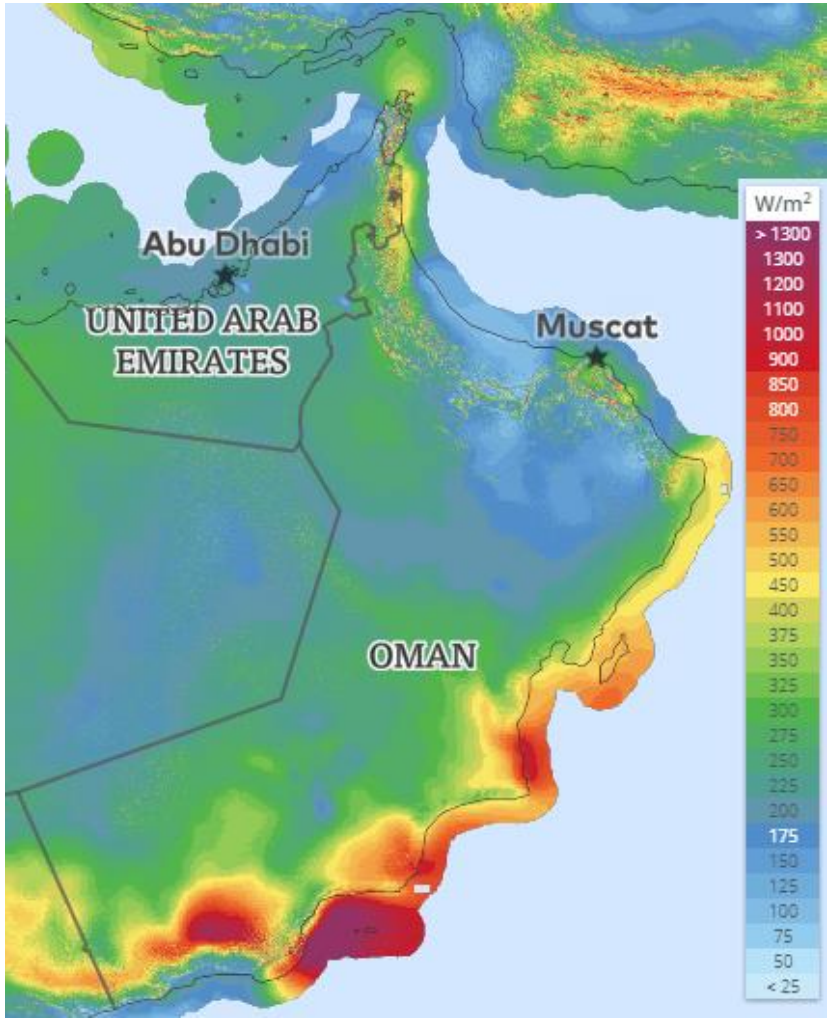
Potential: 4.4 to 5.6 GWh/kWp
Installed Capacity: <150MW

Source: https://solargis.info/

Exciting Wind Resources in Oman



Installed Wind Capacity: 55 GW



Installed Wind Capacity: <60 MW

Source: https://globalwindatlas.info/

Oman Initiatives

- 2017: AER introduced Sahim project for rooftop PV system
- 2017: Electricity sector start implementing the Cost Reflective Tariff
- 2017: Energy policy approved the RE contribution target 10% by 2025
- 2018: AER introduced Omani certified energy auditors program
- 2018: Energy Lab. Approved utilization of W2E projects
- 2019: MOG announced new target for RE => 30% by 2030
- 2019: AER introduced Yesser program, energy efficiency initiative
- 2019: Commissioning of Dofar Wind Power Plant, 50MW

Renewable Energy Development Plan

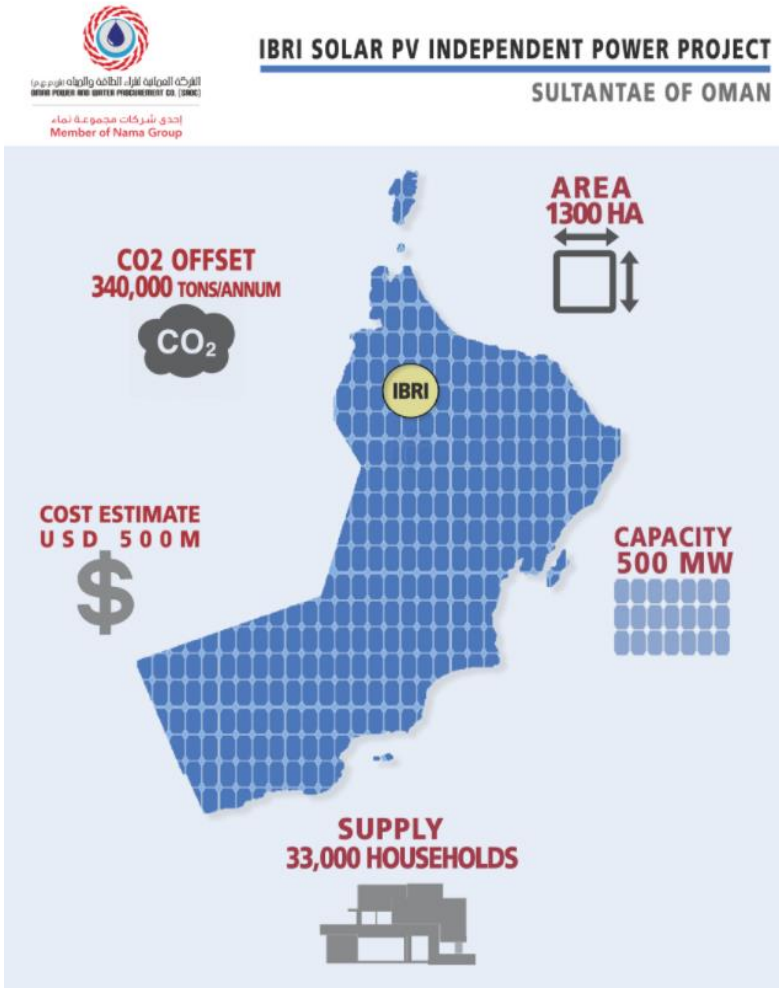
	2018	2019	2020	2021	2022	2023	2024
				MW			
Dhofar I Wind IPP	-	-	50	50	50	50	50
Ibri II Solar IPP	-	-	-	500	500	500	500
Solar IPP 2022	-	-	-	-	500	500	500
Solar IPP 2023	-	-	-	-	-	500	500
Solar IPP 2024	-	-	-	-	-	-	500
Dhofar II Wind IPP	-	-	-	-	-	150	150
Wind IPP 2023	-	-	-	-	-	200	200
Wind IPP 2024	-	-	-	-	-	-	200
Waste to Energy 1	-	-	-	-	-	50	50
Total Capacity	**-**	**-**	**50**	**550**	**1,050**	**1,950**	**2,650**

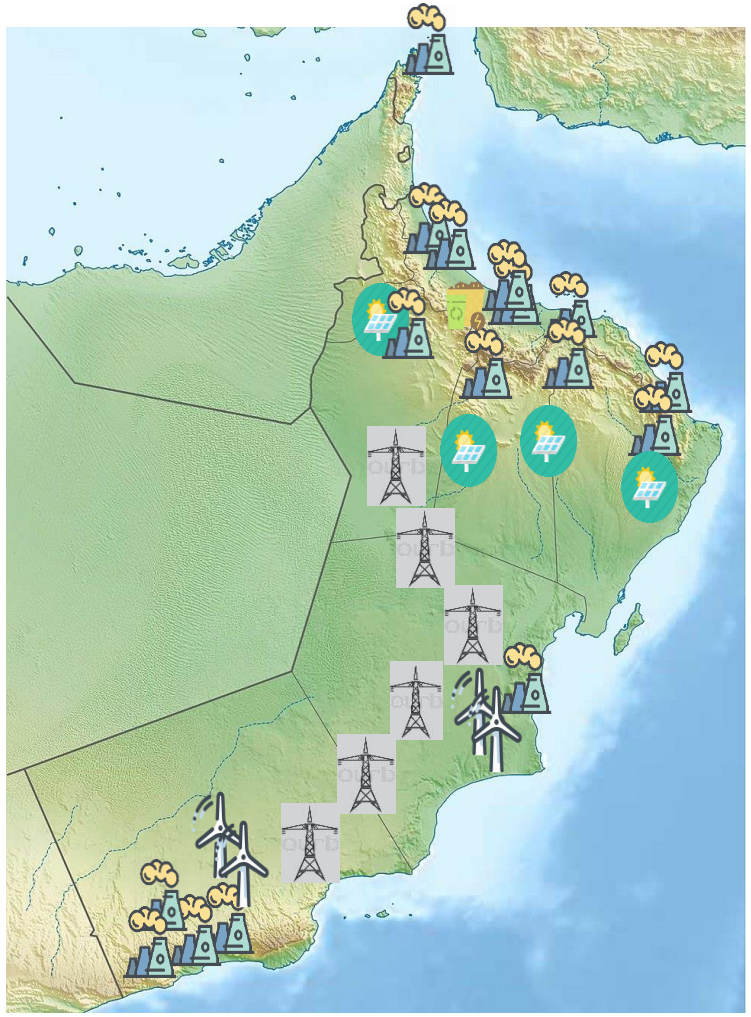
Source: Oman Power and Water Procurement Company

Work is Being Done: Wind Generation

- 50MW Wind Farm in Harweel
  - Massive 3.8MW GE turbines - Will be commissioned soon, 2019

Work is Being Done: Solar Generation, 1st Large-scale PV





Source: Oman Power and Water Procurement Company

Sahim PV Rooftop Project

هيئة تنظيم الكهرباء - عمان
AUTHORITY FOR ELECTRICITY REGULATION, OMAN

ما الفائدة التي تعود على المشترك؟

سيساعدك تركيب الألواح الشمسية في منزلك على التحكم في تكاليف الكهرباء وتخفيض قيمة فواتير استهلاكها. كما ستساهم الآلية التي وضعت للحوافز للإستفادة من الكهرباء التي يتم تصديرها للشبكة والتي تم إنتاجها عن طريق الخلايا الشمسية للإستهلاك الذاتي وتصدير الفائض للشبكة.

What's in it for me?

Installing a solar PV system in your home will help you control energy costs and reduce your electricity bills. An incentive scheme has been introduced for consumers to benefit from the electricity generated by solar by exporting energy back into the local grid and decreasing dependency on traditionally generated electricity.

تأثيرنا
Our impact

يتميز هذا المشروع بالعديد من الفوائد حيث أن إستخدام الطاقة الشمسية عوضاً عن مصادر الطاقة التقليدية سيؤدي إلى انخفاض انبعاثات غازات الكربون الضارة والحفاظ على جودة الهواء، وصون وتوفير موارد الغاز الطبيعي. ويمكن بعد ذلك الاستفادة من الموارد التي يتم توفيرها في إستخدامات أخرى ذات قيمة أعلى من شأنها تعزيز مسيرة التنمية الوطنية، وتوفير الفرص الوظيفية للكوادر المحلية، وإضافة صناعات وقطاعات جديدة، فضلاً عن دفع عجلة التنويع الاقتصادي.

Sustainable Future
مستقبل مستدام

Green Houses
البيوت الصديقة للبيئة

Solar Panels
الألواح الشمسية

Safe Planet
كوكب آمن

The potential impact of using a solar PV systems is immense. Using solar instead of traditional sources of energy will reduce carbon emissions, protect air quality, and help preserve precious natural gas resources. These resources can be used in other applications to generate economic growth, creating jobs and new industries and supporting diversification efforts.

Authority for Electricity Regulation
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سهام
Sahim

معاً من أجل اليوم والمستقبل

Together for today AND TOMORROW

مبادرة الطاقة المتجددة

تهدف مبادرة ساهم للطاقة المتجددة إلى تشجيع إستخدام الطاقة الشمسية النظيفة من أجل إيجاد مصدر مستدام للسلطنة والأجيال القادمة. وتعتمد هذه المبادرة إلى تركيب الألواح الشمسية في الوحدات السكنية لإستخدام أشعة الشمس لتوليد الطاقة الكهربائية، والتي ستساهم بدورها في الحدّ من مستوى الاعتماد على مصادر الطاقة التقليدية وإيجاد فائض من الطاقة يعود بالنفع على المجتمع.

كيف يعمل المشروع؟

تُعد الطاقة الشمسية طاقة نظيفة وآمنة وغير محدودة يتم توليدها من أشعة الشمس، ويمكن الاستفادة من هذه الطاقة البديلة لإنتاج الكهرباء عن طريق الخلايا الشمسية التي تعمل على امتصاص أشعة الشمس وتحويلها إلى طاقة كهربائية. ومن خلال هذا المشروع يتم استخدام هذه التقنية لتوليد الكهرباء في الوحدات السكنية أو في المرافق العامة والخاصة و لا تقتصر مزاياها على توفير الطاقة الكهربائية فقط بل تشمل أيضاً إعادة توجيه الطاقة الزائدة إلى الشبكة للاستفادة منها في إستخدامات أخرى.

احصل الآن على طاقة نظيفة ومتجددة وصديقة للبيئة
Get clean, renewable energy today

هناك عددٌ من العوامل التي تحدد ما إذا كان من الممكن الاستفادة من هذه التقنية، وتشمل المساحة المتوفرة ومستوى التعرض للشمس والظل وكذلك نوع وحجم المعدات اللازمة. إليكم بعض الخطوات التي يجب اتخاذها لتحويل منازلكم إلى منازل صديقة للبيئة.

A variety of factors determine whether a solar PV system can be installed in your home, including the building surface, exposure to the sun, as well as the type and size of the equipment required. Here are the steps you need to take to make your home more eco-friendly:

1. **الاستشارة:** اتصل بشركة توزيع الكهرباء المحلية للحصول على قائمة المقاولين المعتمدين والمخولين بتنفيذ مشاريع تركيب الألواح الشمسية في المنازل، وقد تم تسجيل و إعتماد هؤلاء المقاولين بواسطة مجلس مراجعة قواعد التوزيع (DCRP).

Consultation: Contact your electricity distribution company to obtain a list of contractors authorized to assess your home for the installation of solar panels. These contractors are approved and certified by the Distribution Code Review Panel (DCRP).

2. **التصميم:** سيقوم المقاول بمساعدتك في إختيار التصميم المناسب لمنزلك، ويتم بعد ذلك إرسال التصميم إلى شركة توزيع الكهرباء المحلية لاعتماده. وفي هذه المرحلة، سيتولى المقاول مهمة الحصول على كافة الموافقات والتصاريح المطلوبة قبل البدء في عملية تركيب النظام.

Design: The contractor will help you choose a design that is suitable for your home. The proposed design will then be submitted to your local electricity company for approval. At this stage, your contractor will ensure all approvals and permits are obtained before beginning installation.

3. **التركيب:** يتولى المقاول مهام تركيب الألواح الشمسية وعند الإنتهاء من أعمال التركيب يجب إخطار شركة توزيع الكهرباء من أجل إكمال عملية الفحص والتقييم اللازمة.

Installation: Once installation is completed by the contractor, the distribution company will be notified in order to complete the required inspection process.

4. **الإنتاج:** بعد الحصول على الموافقة، سيتم توصيل النظام بشبكة الكهرباء ويمكنك بعدها البدء في إنتاج الطاقة الكهربائية باستخدام طاقة الشمس النظيفة.

Production: Upon approval, your system will be connected to the electricity grid. You're now all set to begin producing solar energy!

A renewable energy initiative

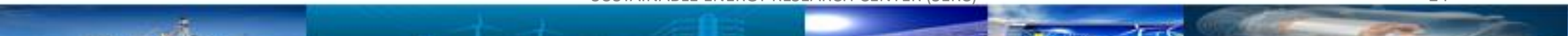
Sahim is a renewable energy initiative geared towards encouraging the use of alternative energy to create a sustainable future for the Sultanate. Meaning 'contribute' in Arabic, Sahim will include a multitude of projects under its umbrella, starting with solar photovoltaic (PV) systems. These systems will use energy from the sun to generate electricity. The electricity produced will help reduce the reliance on traditional energy sources and create a surplus of power to benefit the entire community.

How do solar PV systems work?

Solar power is a clean, safe, and unlimited form of energy that is generated using sunlight. This alternative energy can be harnessed to produce electricity through the use of PV panels, which absorb sunlight and convert it to electric current. The solar PV systems will use these panels to generate electricity in homes as well as public and private facilities. Connected to the existing electricity grid, not only will the system power your home, but also export any surplus electricity into the grid.

للحصول على المزيد من المعلومات حول كيفية المساهمة في الحفاظ على البيئة ومعرفة فوائدها من خلال استخدام الطاقة النظيفة والمتجددة، يرجى الاتصال بشركة توزيع الكهرباء المحلية

For more information about how you can help preserve the environment with clean, renewable energy, please contact your local electricity provider.



PDO-GlassPoint 1GW Miraah Project

Petroleum Development Oman (PDO), the largest producer of oil and gas in Oman, and VC-funded GlassPoint just announced a $600 million deal for the largest solar plant on the planet. The 1,021-megawatt "Miraah" project is a turnkey system that will be owned and operated by PDO, generating 6,000 tons of steam per day to coax viscous oil from Oman's Amal oil field.

PDO Amin 105 MWp PV Project

- **105 MW solar power project at Amin**
- **Total area ~ 4km2**
- **23 years PPA power purchase agreement**
- **Commercial operation date is projected for May 2020**
- **Saving of 70.5 million m3 of gas annually**
- **Reduce CO2 emissions by 137,121 t annually**

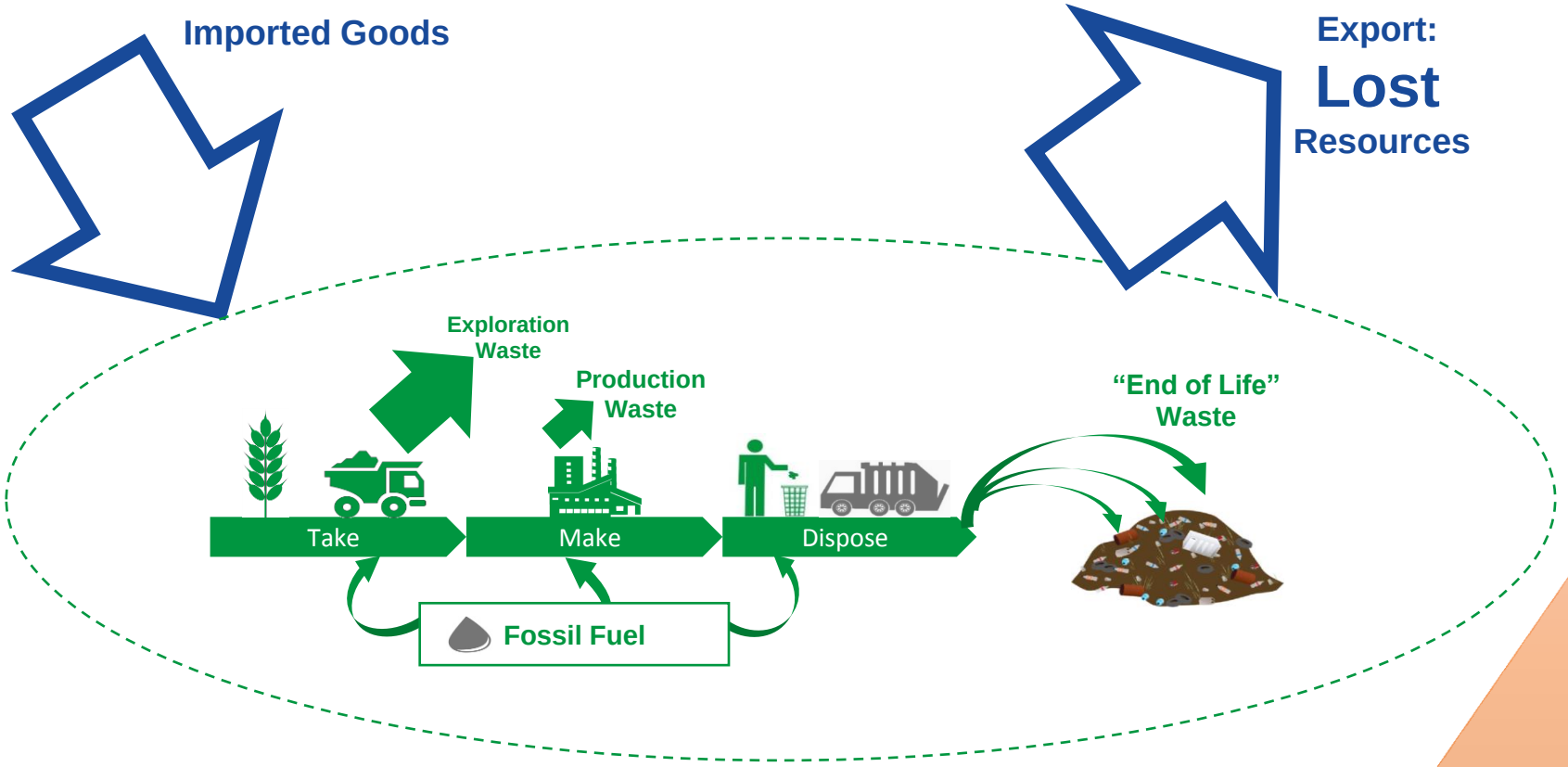
Oman Waste Management

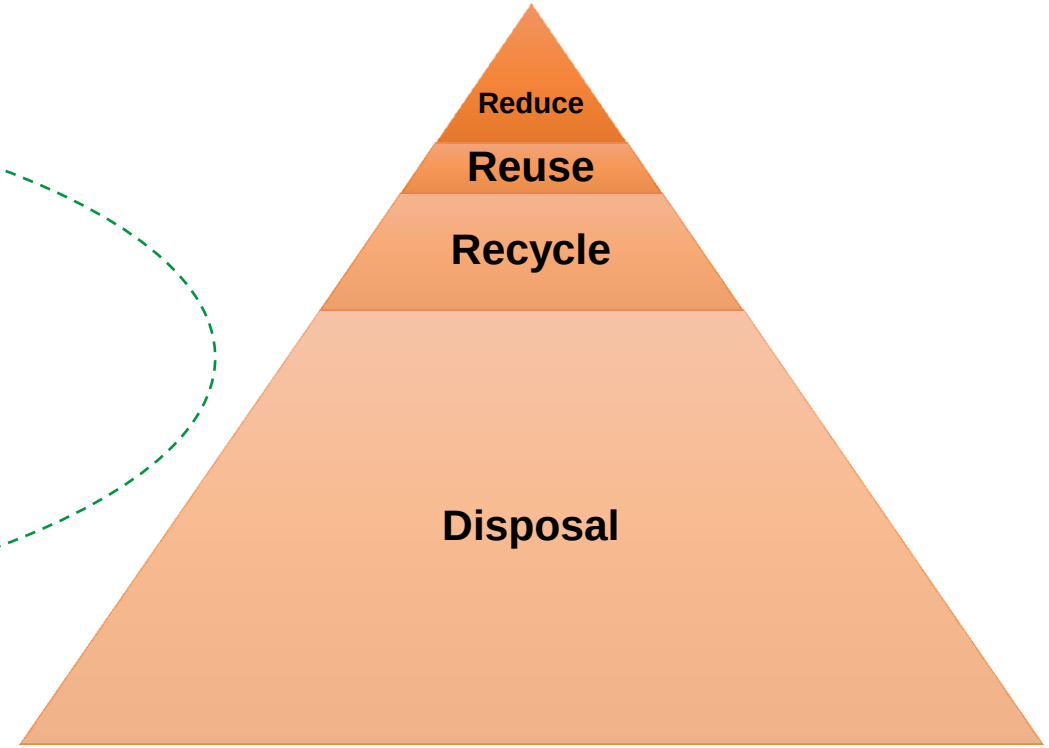
Royal Decree 46/2009

Royal Decree No. 46/2009 in connection with management and operation of Waste Sector by Oman Holding Company for Environment Services SAOC.

Article one: Oman Holding Company for Environment Services SAOC an (Omani Closed Stock Company fully owned by the government) undertakes implementation of the government policy with regard to the waste sector, management and operation of the sector activities in accordance with the sector strategy being planned by the National Economy Ministry.”

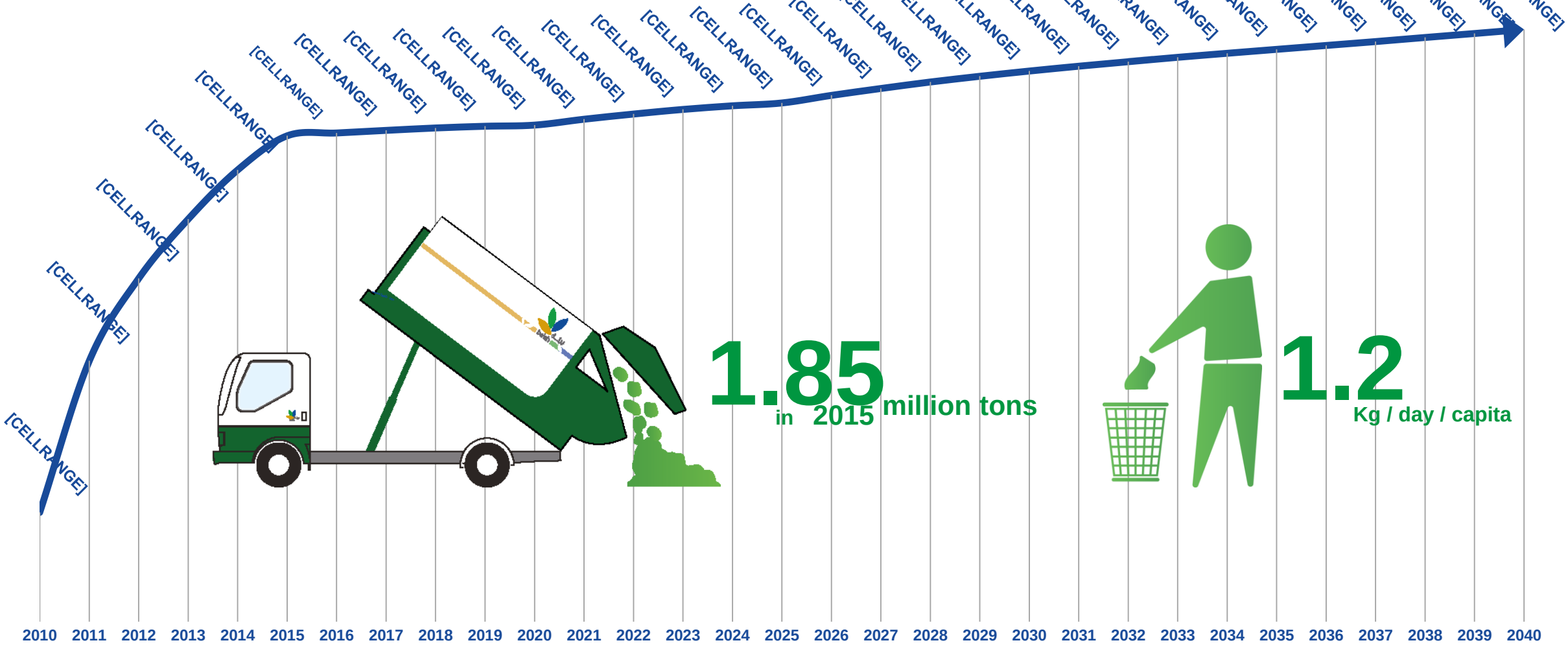
Oman's Economy



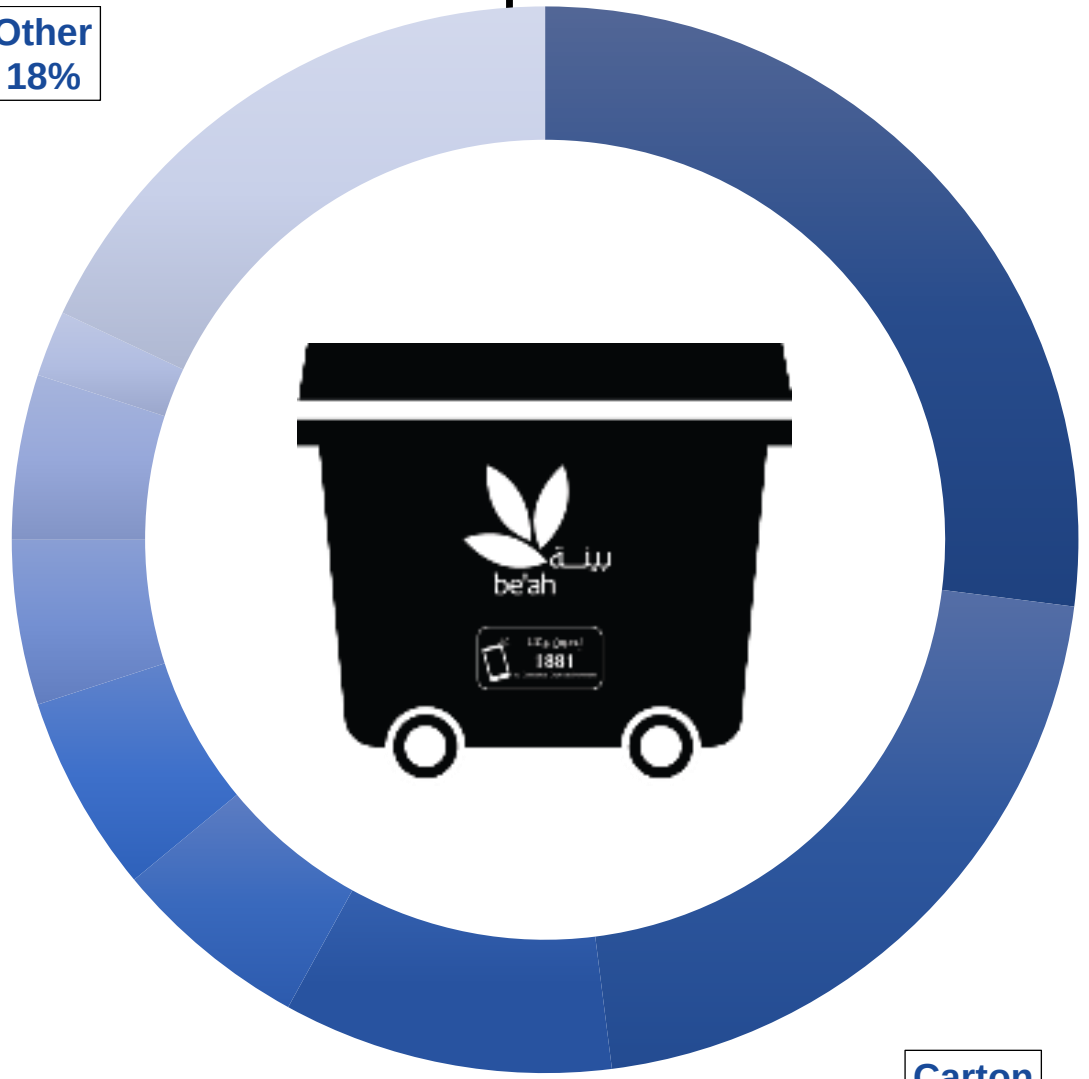


Current Waste Management Practice in Oman

Oman: Municipal Waste Generation



Municipal Waste Composition*



Over **50** million OMR per annum

*be'ah municipal waste composition study (2013)

Oman: Other Waste Streams: Quantities in Tons

38,000 tons*

ELT
Tires

735,341 tons**

C&D
Construction & Demolition

Could reach **3-5 million tons**

* 2014 "ELT Feasibility Study in 2011"

** 2009 Muscat Governorate Field estimate

1,469,835 tons***

Hazardous

4,500 tons***

Healthcare

14,000 tons***

LAB
Lead Acid batteries

45,000 tons****

WEEE
Electrical & Electronic

*** 2015 Estimate "Waste Characterization and Quantification Report in 2013"

**** 2014 "Healthcare Waste Strategy in 2014"

***** 2014 "Feasibility Report for Management of Electronic Waste in 2009"


DANGER
DANGER


JOTUN
2010 12 27

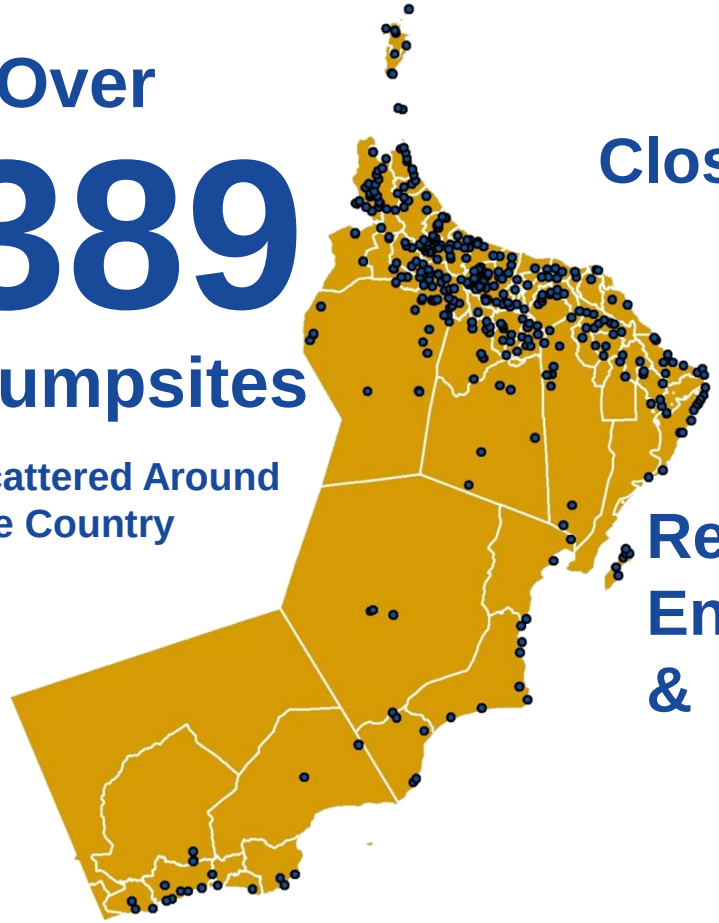
Oman: MSW Infrastructure

Over

389

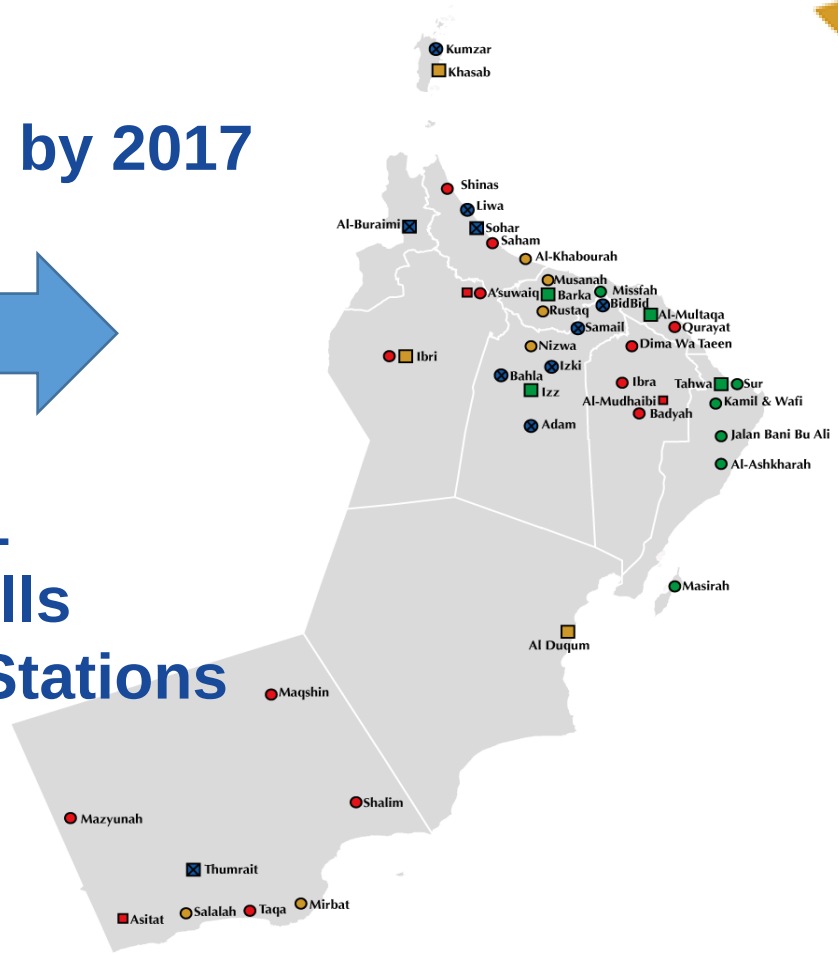
Dumpsites

Scattered Around the Country



Close all Dumpsites by 2017

Replace with 10-11 Engineered Landfills & 18-25 Transfer Stations



be'ah بيئة

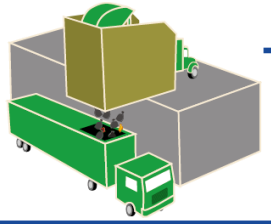
Landfills

- Operational
- Ready for operation
- Under construction
- On hold

Transfer Stations

- Operational
- Ready For Operation
- Under construction
- On Hold

Different ways to handle waste



Transfer Station

Landfill

Sorting

Recycle

Refused Derived Fuel (RDF)

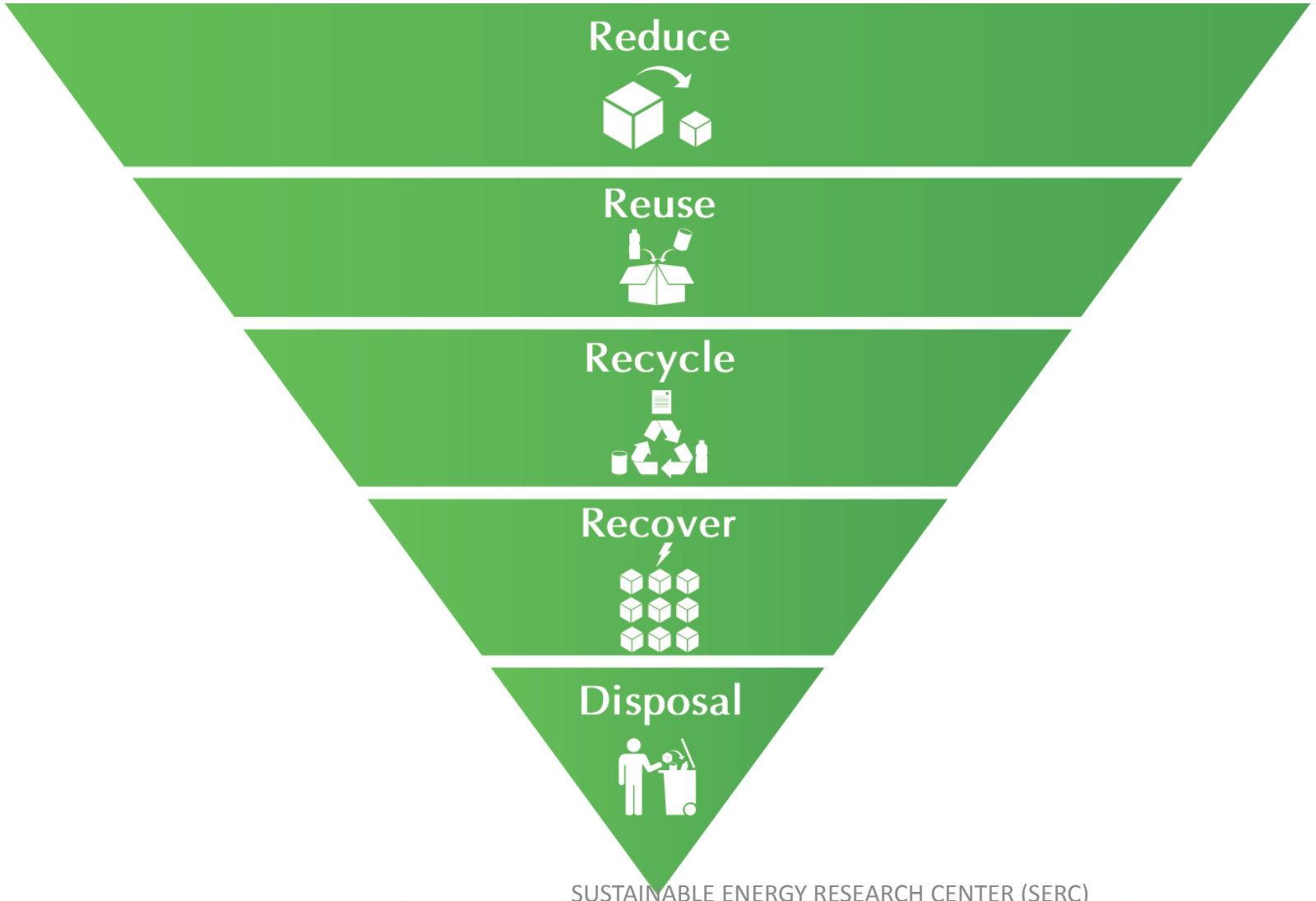
Composting

Recycle

Waste to Energy

Landfilling (Ash)

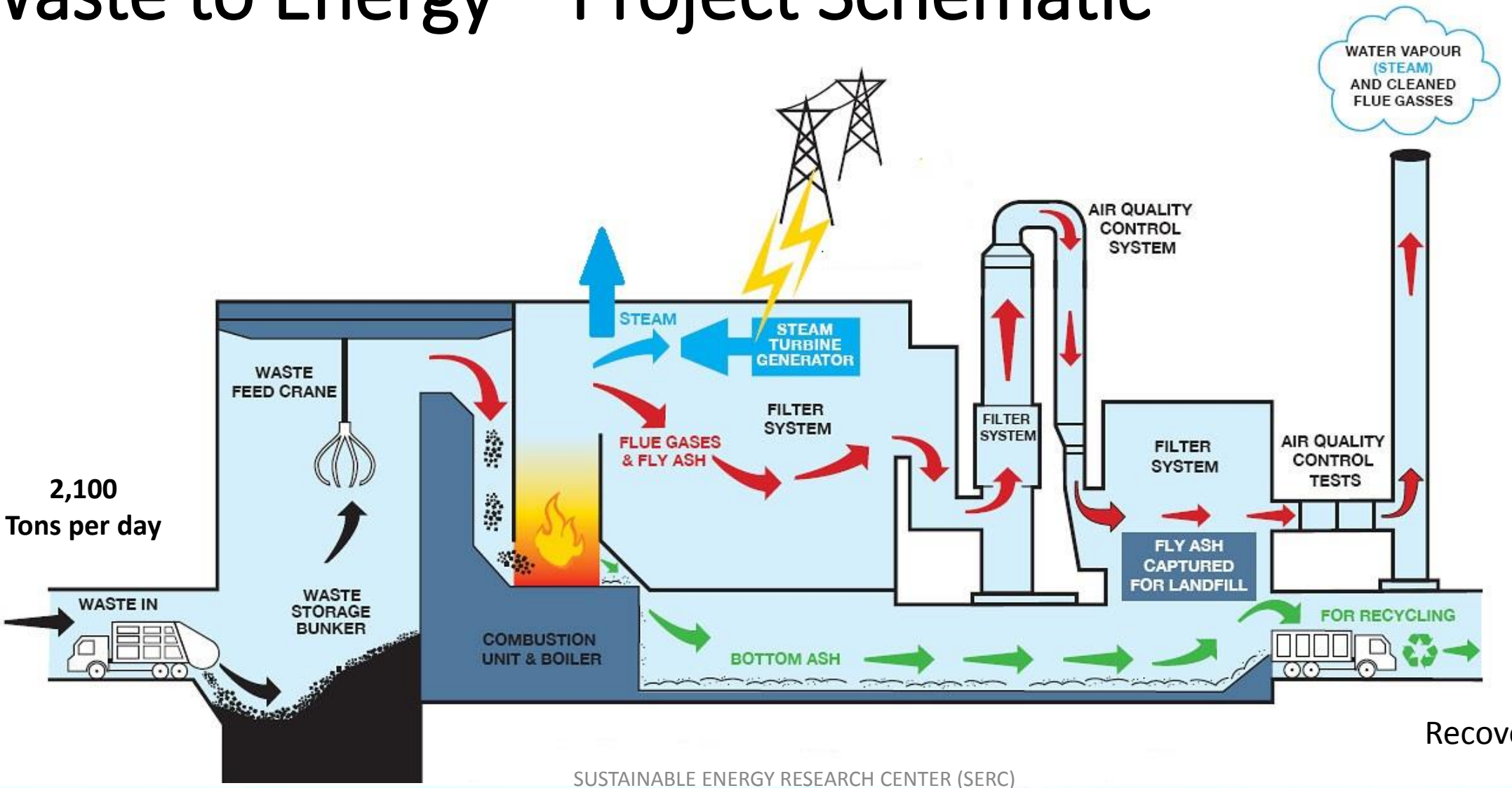
Waste Management Hierarchy



Diversion of waste

Disposal

Waste to Energy – Project Schematic



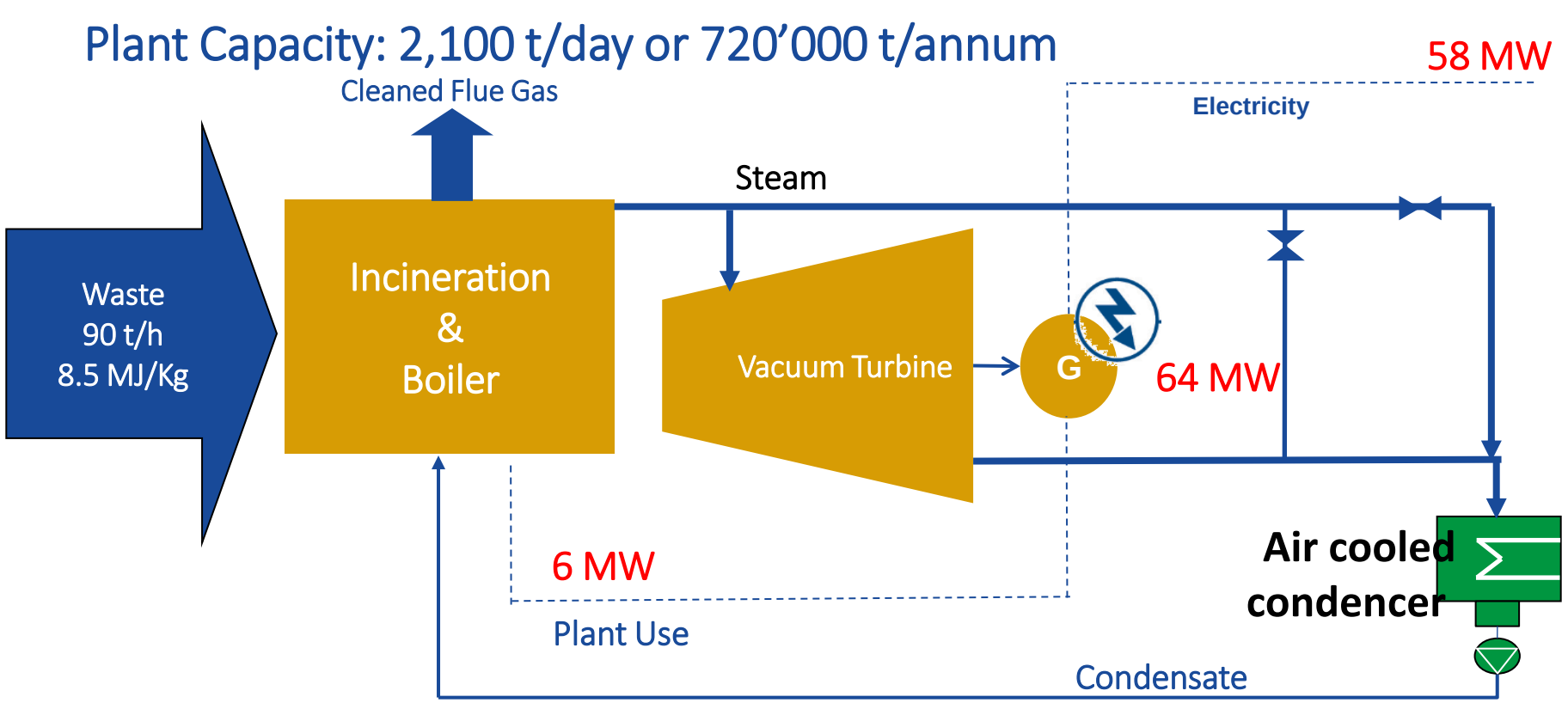
2,100
Tons per day

Recovered Metal

Waste to Energy Project in South Al Batinah

Plant Capacity: 2,100 t/day or 720'000 t/annum

Export to National Grid



1 ton Waste

168 tons Distillate Water

600 kWh Electricity "Net"

Waste to Energy Project in South Al Batinah - Updates

REQUEST FOR PROPOSALS
PROVISION OF TECHNICAL AND ECONOMIC CONSULTANCY SERVICES FOR THE DEVELOPMENT OF A WASTE TO ENERGY INDEPENDENT POWER PROJECT

Oman Power and Water Procurement Company SAOC ("**OPWP**") Member of Nama Group is responsible for the procurement of new electricity generating capacity and water in the Sultanate of Oman in accordance with the requirements of the law for the regulation and privatization of the electricity and related water sector promulgated by Royal Decree 78/2004 and the OPWP licence. In line with Oman's vision to diversify fuel sources for power generation in addition to the support of the Authority of Electricity Regulation (AER) and OPWP towards the waste management strategies of Oman Environmental Services Holding Company's (Be'ah), OPWP is planning to carry out a technical and economic feasibility study for the development of a Waste to Energy independent power project (Project). OPWP seeks a proposal from Interested Bidders to provide Technical and Economic Advisory Services for undertaking the feasibility study, and upon successful outcome, provide Technical Advisory Service for the competitive tendering of the Project. The tender documents are available for purchase from OPWP effective from 14 January to 24 January 2018 either through its offices or by email to OPWP's Procurement Officer. The offices are located on the 5th Floor, Building 5, Muscat Grand Mall, Tilal Complex (Office), Al Khuwair Al Janubiyyah, Muscat. Tender documents are available for collection between the hours of 09.00 to 13.30 from Sunday to Thursday. The tender details are as provided below:

Tender Title	Tender No.	Tender Purchase Price	RFP Clarifications Deadline	Submission Deadline
Provision of Technical and Economic Consultancy Services for the Development of a Waste to Energy Independent Power Project	2/2018	150 OMR	28 January 2018 Before 10.00 hrs. (Gulf Standard Time)	22 February 2018 Before 10.00 hrs (Gulf Standard Time).

The payment for the RFQ document can be processed either by:
Using debit card at OPWP's offices at the time of collection of the RFQ document; or International bank transfer and evidence of the bank transfer is to be submitted at the time of collection of the RFP document at OPWP offices or submitted by email to the procurement officer through **procurement.officer@omanpwp.com** and copy **Prj.wte.ipp@omanpwp.com**.

Bank account details:
Local Bank account details:
Account Name: Oman Power & Water Procurement Company SAOC
Beneficiary Bank: Bank Muscat
Branch: Corporate Branch
Account number: 0423011072740015
Swift code: BMUSOMRXXXX

International Bank details:
Correspondent Bank: JP Morgan Chase Bank, New York
Address: 4 New York Plaza, Floor 15, New York
ABA No. 021 000021
Chips No. CP0002
SWIFT Code: BMUSOMRXXXX
Beneficiary Bank: Bank Muscat
Beneficiary Bank Account No: 544-7-35232
Beneficiary Name: Oman Power and Water Procurement Company SAOC

A bank guarantee of not less than 1% of the tender value, and valid for 120 days from the submission date, shall be enclosed as part of the tender. OPWP is not obliged to accept the lowest tender offer.

Oman Power And Water Procurement Co. S.A.O.C.
P.O. Box 1388, Postal Code 112, Sultanate of Oman Ruwi.

2016-2017:
be'ah finished a feasibility study with Ramboll

2018:
OPWP floated a tender for the tariff and project development

IPP tender for the waste to energy is expected soon by 2020.

Waste to Fuel (RDF) – Cement Industry

MBT

Organics

Metals

Recycle

Inert

Composting

Landfill

Waste with high calorific value

Refused Derived Fuel (RDF)

Industries
(Cement or Waste to Energy)

Waste to Steam– Enhanced Oil Recovery

3120 tons

Waste collected and transport

- Insure MSW quantity of RDF through "Supply Agreement with RDF Plant"
- Assuming no gate fees

RDF Facilities*

Daily MSW Input	Location	Daily RDF Output
116 tons	Ad Dhahrah	77 tons
386 tons	Al Dhakhiliyah	256 tons
2075 tons	Muscat	1375 tons
250 tons	N Sharqiyah	160 tons
303 tons	S Sharqiyah	200 tons

RDF Management

RDF 1909 tons

SPV

- Insure quantity and quality of RDF through "Supply Agreement with Plant"
- Transport from RDF generation Site to Plant
- Can source out material and/or RDF from other places

Steam Generation

Waste to steam

- BOO Model with a developer
- Energy purchase agreement
- Guarantee steam specs

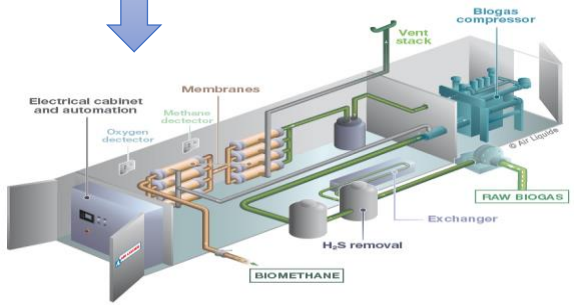
RDF material flow

steam

Cash flow

Biogas Recovery

Biogas



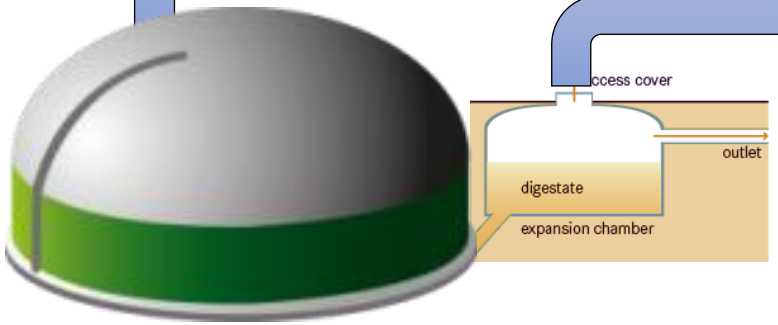
Biogas cleaning and upgrading

Electricity

Heat generation

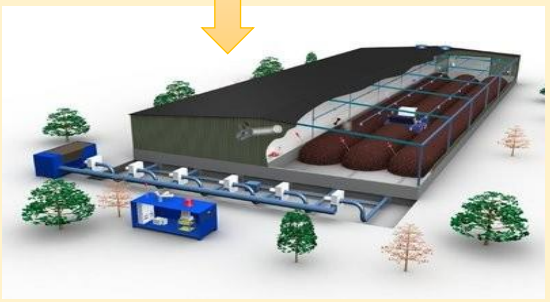
Refrigeration

Domestic



Biogas facility

Fertilizer

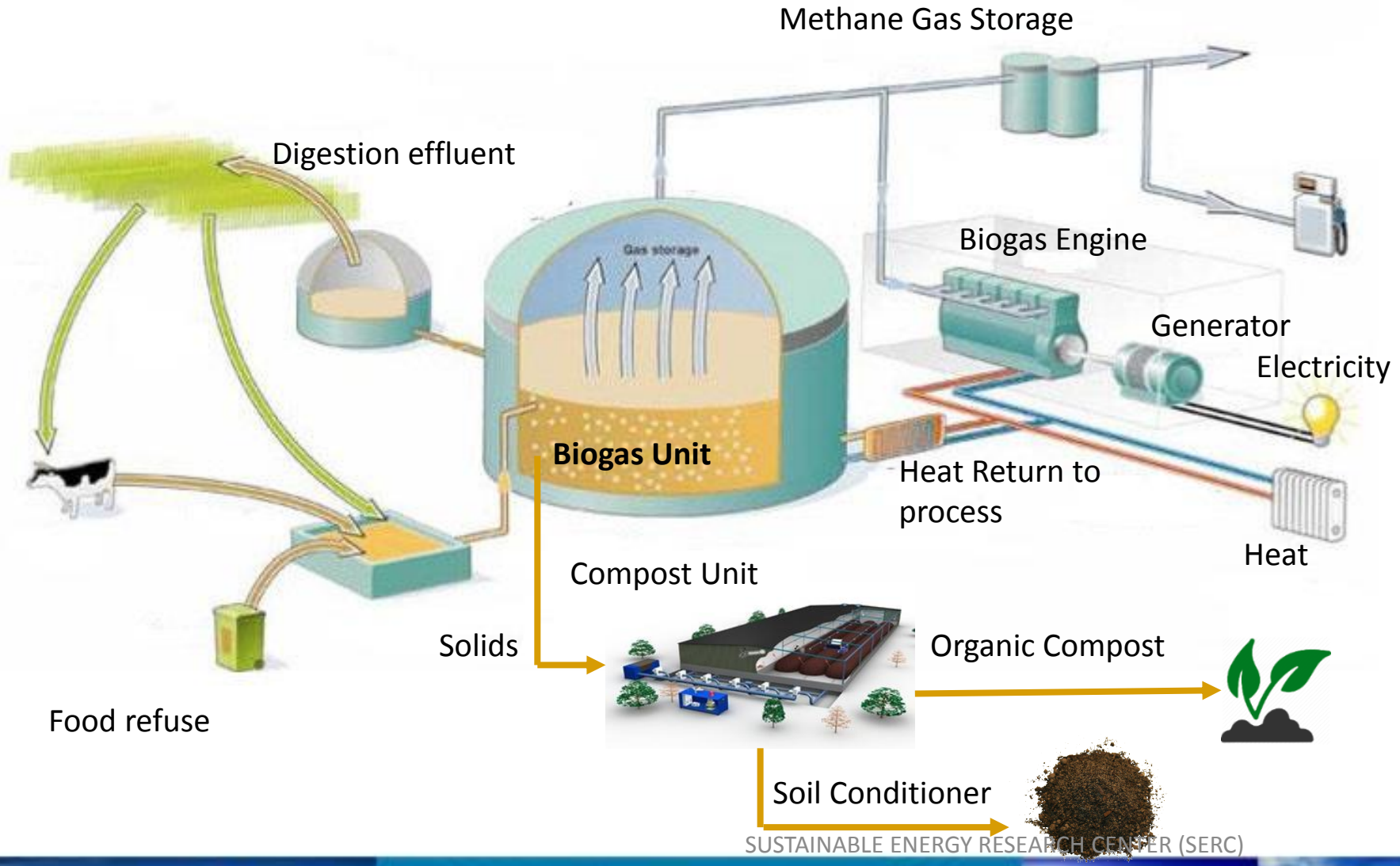


Compost facility

Organic compost

Soil conditioner

Biogas Recovery



10 & More

Potential Projects

0.5 ~ 2 MW

Power Output

Rural Electrification

Current Status of SQU Material Flow

Zero Emission Campus Readiness of Sultan Qaboos University

IfaS

جامعة السلطان قابوس
Sultan Qaboos University

I/O	CATEGORY	FLOW SPECIFICATIONS	SUBSYSTEM	UNIT [per annum]	QUANTITY
INPUTS	Energy [P]	Diesel	Mobility	L	64,060
		Gasoline	Mobility	L	492,533
		Natural Gas	Boilers Cookers/Stoves Incinerator	m^3	1,067,523.5
	Energy [E]	Electricity	Cooling/Heating Pumps Illumination sys.	GWh	122
	Water	Freshwater	Potable water	m^3	952,847.1
			Irrigation	m^3	730,000
OUTPUTS	Emissions	Solids	MSW	t	7,441
		Liquids	Wastewater	m^3	985,500
		Gaseous emissions	GHGs	tCO_{2e}	176,745

NOTE: all units refer to the temporal boundary, 2018; Energy [P]= Primary energy; Energy [E]= End energy.

SQU Reuse Center
30,000 m2

SQU Campus = ~ 6km2
18000 students
6000 employees
~800 support staff
SQUH

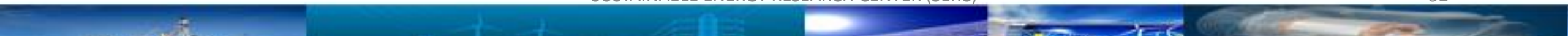
SQU Rooftop PV system
5.5 MW capacity

SIEMENS
Ingenuity for life

SQU Car Park PV system
14 MW capacity

SQU Biogas Power Plant
2 MW capacity

SQU RE and W2E will produce 40% of the existing demand



Summary

- Oman electricity demand growth ~ 6%, which is non-sustainable
- Oman decided to diversify the existing energy resources:
  - RE to will represent 10% of total demand by 2025
  - RE to will represent 30% of total demand by 2030
- Circular Economy via Waste to Energy will play a role in the energy mix
- SQU CE : plan to transfer to Zero emission & green campus
  - Solar PV generation ~ 20MWp (car park and rooftop)
  - Organic waste plant 2MW Biogas, in collaboration with Beah
  - 1st Reuse Center in Oman in collaboration with Beah, total area of 30,000 m^2
  - Energy efficiency for SQU Buildings, will reduce 20% of the existing consumption

Up Coming Events at SQU

First International Conference on Research & Innovation in support of Economic and Digital Transformation in Oman: Achieving Vision 2040

19-20 October 2020
Conference & Exhibition Halls
Sultan Qaboos University

16th Hydrogen Power Theoretical & Engineering Solutions International Symposium

HYPOTHESIS XVI
15-17 February 2021
Conference & Exhibition Halls
Sultan Qaboos University

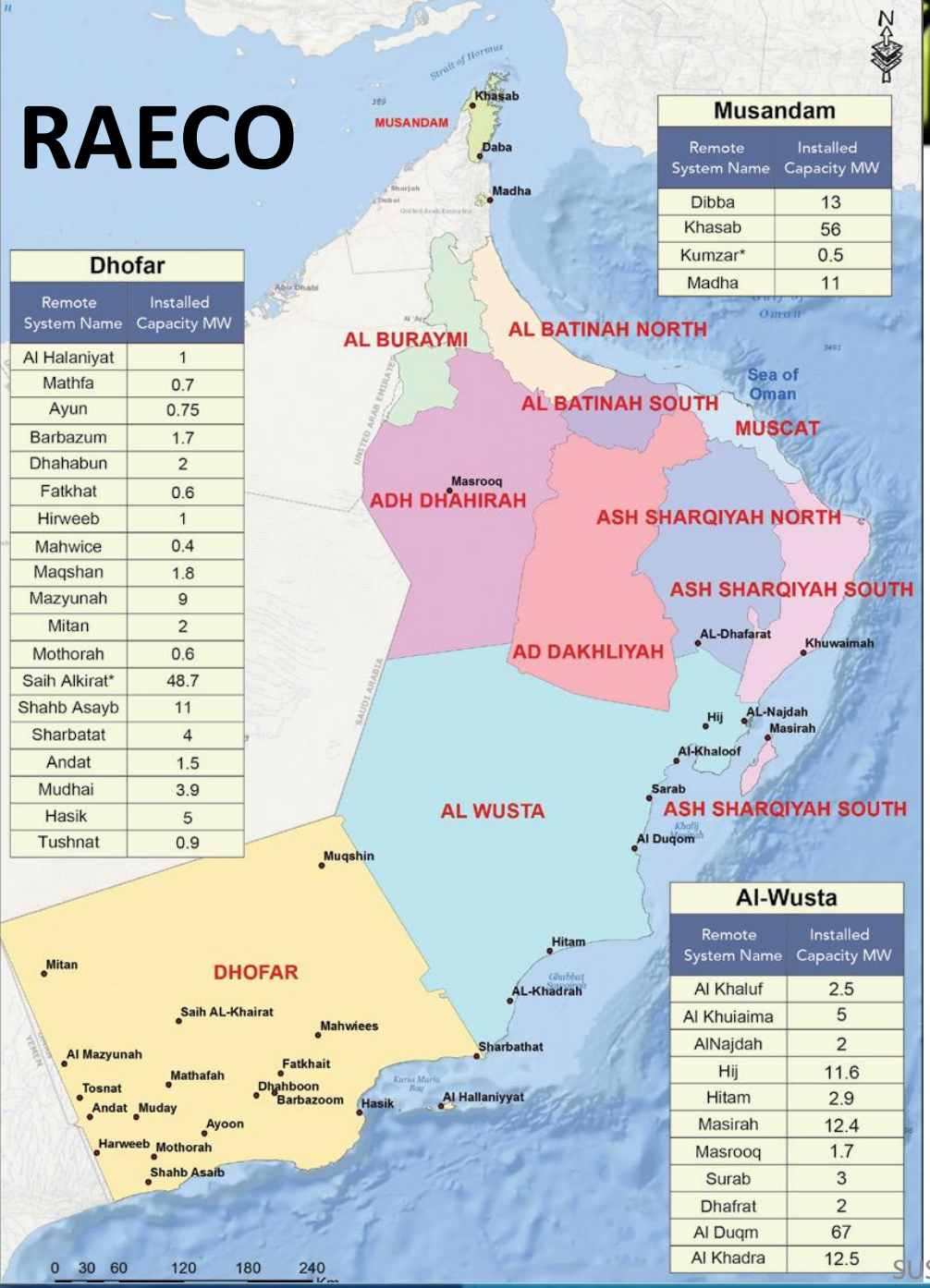
World Renewable Energy Congress 21

4-8 April 2021
Oman Convention Centre

Thank you for your attention

SUSTAINABLE ENERGY RESEARCH CENTER
https://www.squ.edu.om/serc/
Road B, Street 6, Villa 27
Tel .: (968) 24141989

RAECO



Musandam

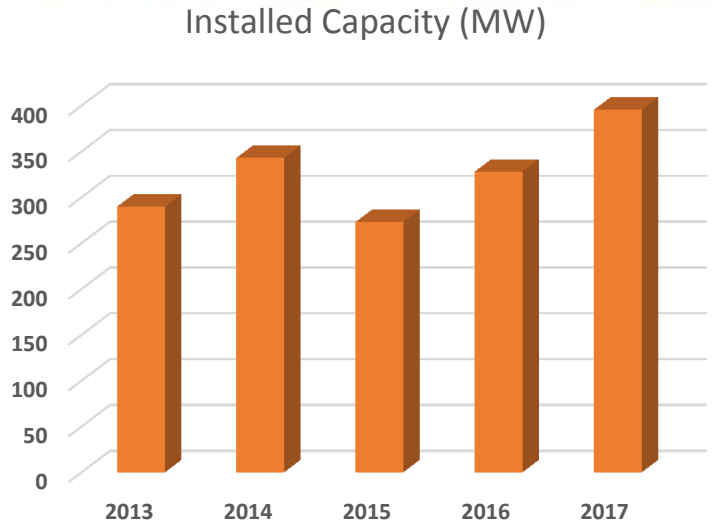
Remote System Name	Installed Capacity MW
Dibba	13
Khasab	56
Kumzar*	0.5
Madha	11

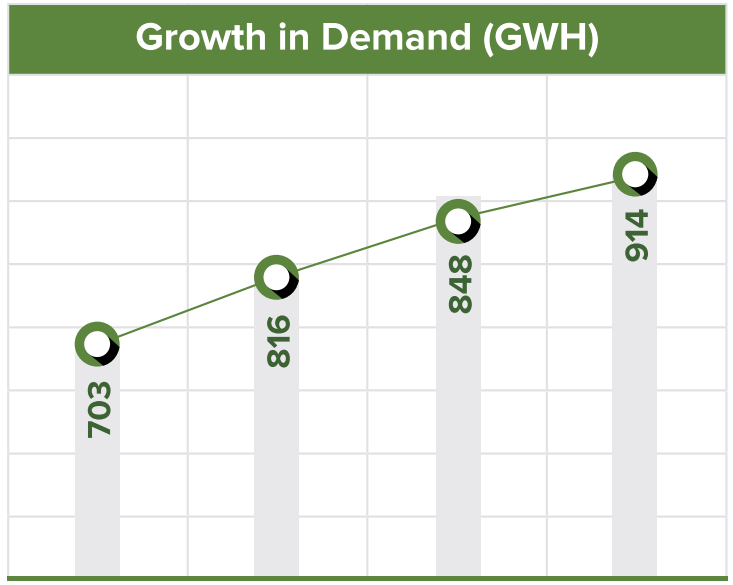
Dhofar

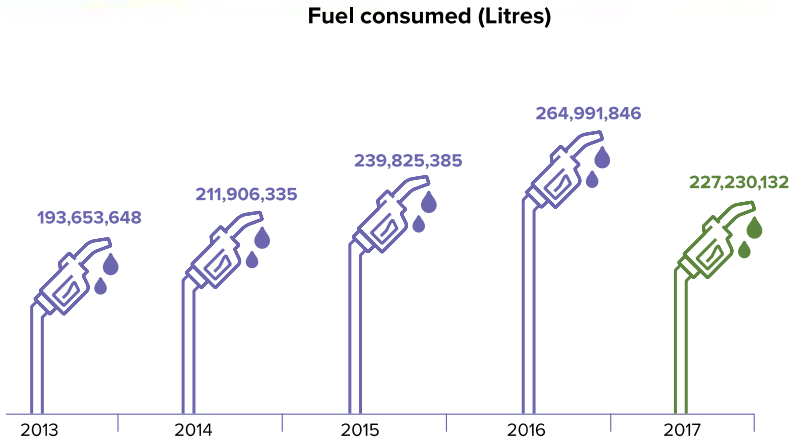
Remote System Name	Installed Capacity MW
Al Halaniyat	1
Mathfa	0.7
Ayun	0.75
Barbazum	1.7
Dhahabun	2
Fatkhat	0.6
Hirweeb	1
Mahwice	0.4
Maqshan	1.8
Mazyunah	9
Mitan	2
Mothorah	0.6
Saih Alkirat*	48.7
Shahb Asayb	11
Sharbatat	4
Andat	1.5
Mudhai	3.9
Hasik	5
Tushnat	0.9

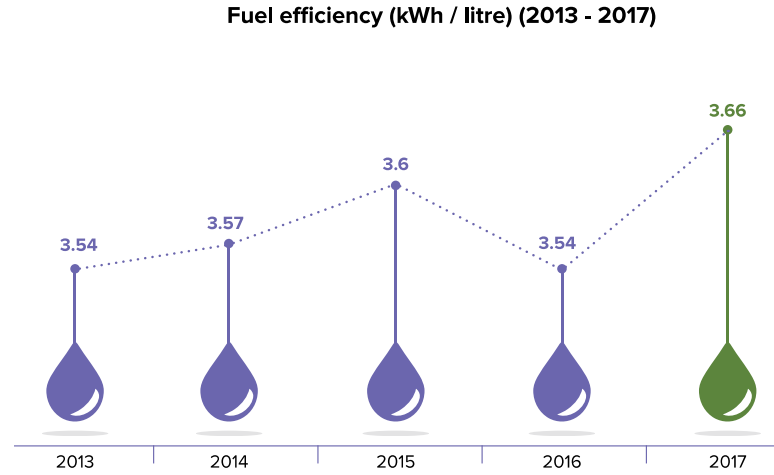
Al-Wusta

Remote System Name	Installed Capacity MW
Al Khaluf	2.5
Al Khuiaima	5
AlNajdah	2
Hij	11.6
Hitam	2.9
Masirah	12.4
Masrooq	1.7
Surab	3
Dhafrat	2
Al Duqm	67
Al Khadra	12.5









Source: RAECO Annual reports

Evaluation of Utilizing Methanol Fuel for Electricity Generation in Oman, Application to Rural Areas and Remote Locations

This study promotes the following advantages:

- Maximize the benefits and bring added value to the locally produced methanol.
- Contribute to fulfil the country's commitment to reducing CO_2 emission, improve the energy efficiency by promoting methanol fuel instead of conventional diesel particularly in remote areas.
- Utilize methanol or its derivatives namely dimethyl ether or dimethyl carbonate as a diesel additive for electricity generation.

Production of METHANOL from Renewable Resources