TURNING CO_2 INTO VALUE

FUELS & CHEMICALS FROM SOLAR ENERGY | THE PHOTO2FUEL JOURNEY

6 AUGUST 2025

ORGANISED BY: Kneia idener

PHOTO2FUEL

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Driving Innovation:
SOCAR's Experience in Industrial R&D

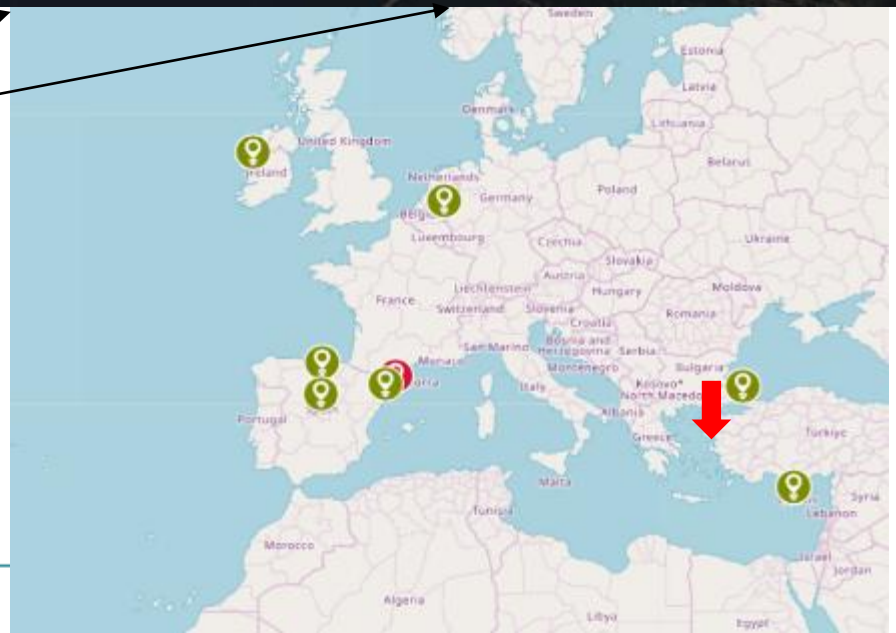
Celal G. Ogulgönen
Sustainability & Decarbonization Supervisor

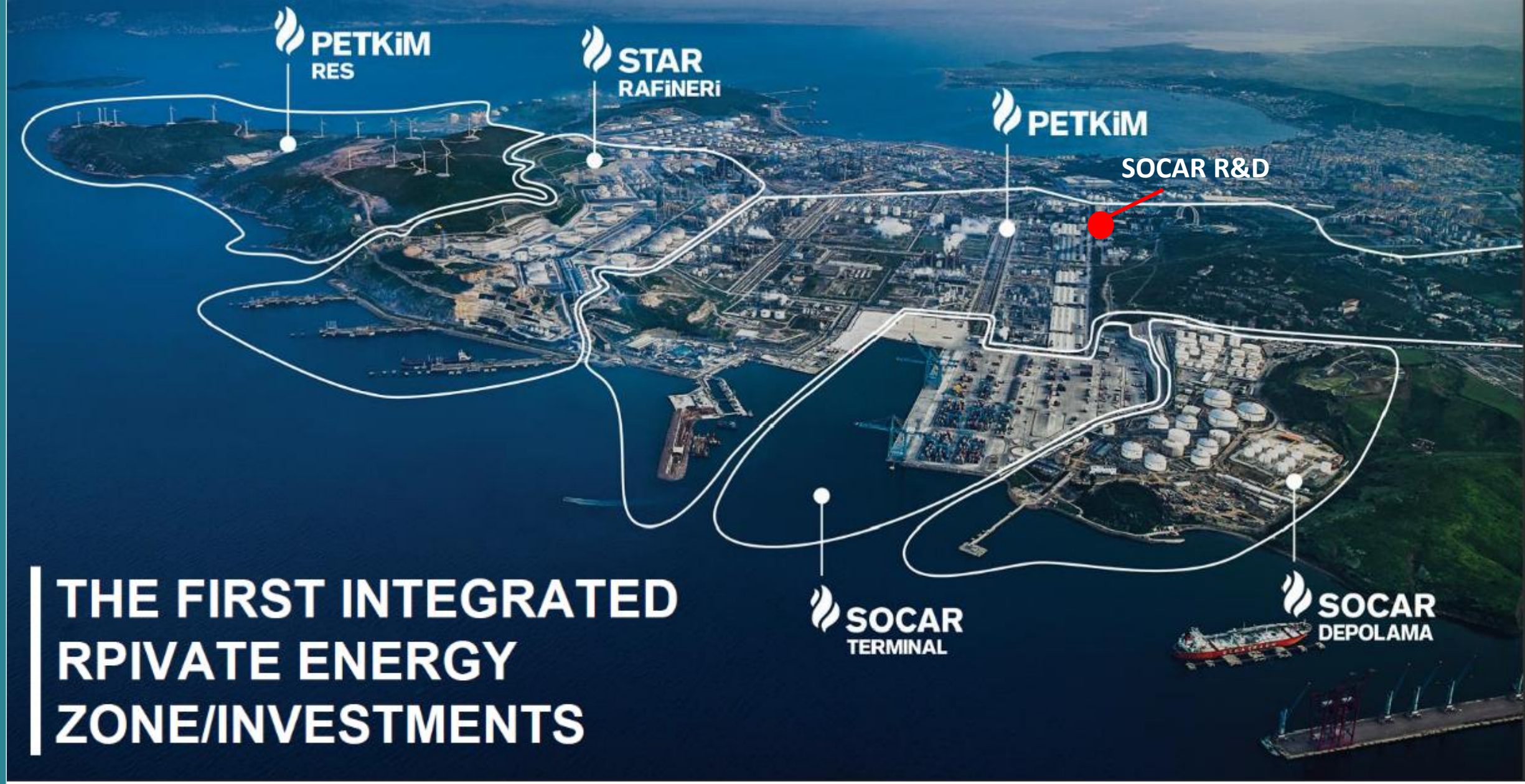
SOCAR
AR-GE

SOCAR TURKEY's Investments

Refinery & **P**etrochemicals **B**usiness **U**nit (R&P BU)

SOCAR R&D and Innovation Center
Process & Technology Development
Product & Application Development
Biotech. Development
Project Management Office





THE FIRST INTEGRATED RPIVATE ENERGY ZONE/INVESTMENTS

Sustainability and Decarbonization Focus

EU-funded projects

CARMOF	Tailor-made 3D-Printed Structures Based On CNT and MOF Materials for Efficient CO_2 Capture
CO2FOKUS	CO_2 Utilization Focused on Market Relevant Dimethyl Ether Production, via 3D-Printed Reactor and Solid Oxide Cell Based Technologies
NEFERTITI	Innovative Photocatalysts Integrated in Flow Photoreactor Systems for Direct CO_2 and H_2O Conversion into Solar Fuels
LOUISE	Low-Cost CO_2 Capture by Chemical Looping Combustion of Waste-Derived Fuels
Circular TwAIn	AI Platform for Integrated Sustainable and Circular Manufacturing
ALGAESOL	Sustainable Aviation and Shipping Fuels from Microalgae and Direct Solar Bio-electrochemical (BES) Technologies

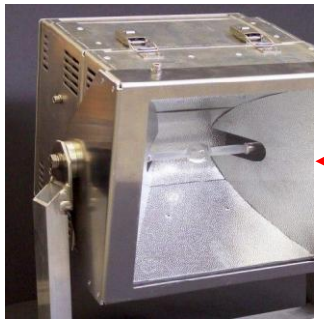
		Collab.
Energy transition	Development and Design of Novel MeOH/DME Reactor	
	Renewable Diesel Production From Algal Lipids Over Solid Catalysts	
	C2Olefins: Direct Olefin and/or Aromatics Production from CO_2 via Zeolite/Metal Oxide Tandem Catalysts	
	Electrocatalytic Hydrogenation to Produce Value-Added Chemicals	
	Catalyst & Process Development for the SAF Production from CO_2	
	Algae to Biofuels	
H_2 tech.	Dimethyl Ether Production Over Bifunctional Catalysts	
	Solar Energy Storage in Chemical Bonds	
	Methane Pyrolysis with Plasma Technologies	
Circular economy	Recalcitrant and Toxic Phenols: Bacterial Degradation and Bioremediation (RETOXPHE)	
	Upcycling of Waste Olefins into Naphtha	
	Bioplastics Production from the Side Products of Bacterial Metabolism (BIOLINK)	
	Commercialization and Production of Environmental Biotechnology Products	

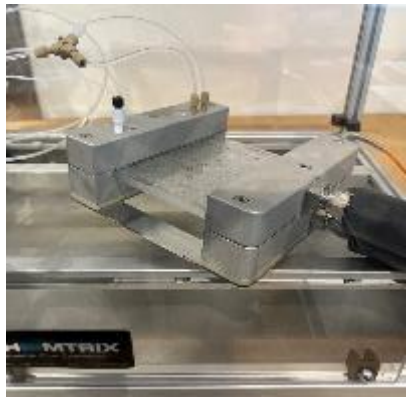
University · Private company · TÜBİTAK (National Science Foundation)

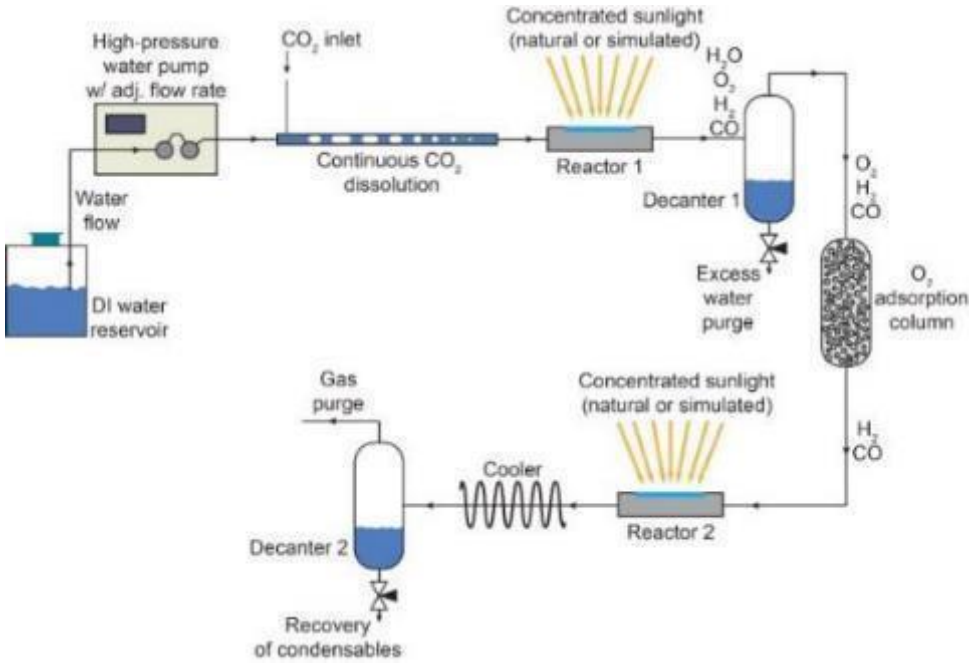
What do we need?

Reactor itself –intro to NEF rrs, lenses and the tracker

Light source / Sunlight utilization –metal halides, Xe arc simulator, and needs for outdoor ops





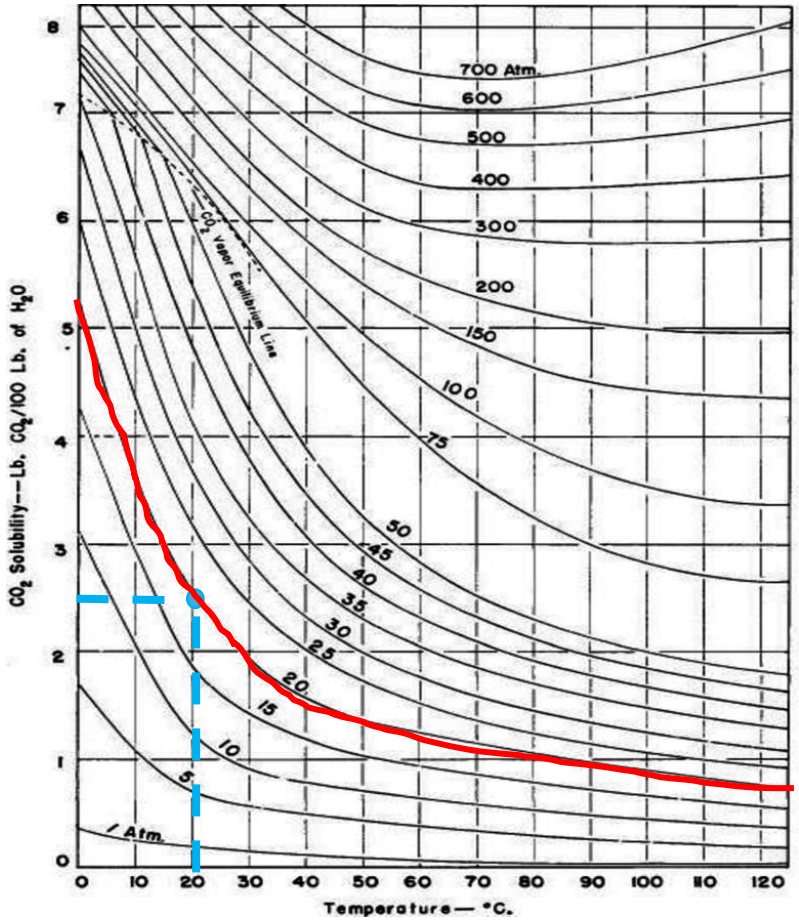


What do we need?

Flow(s), Pressure(s), Temperature(s) constraints –feeding strategy or solubility of CO_2

Flow and reactor specifications	
Reactor size	1st prototype: 25 mm x 50 mm x 1.5 mm 2nd prototype: 150 mm x 150 mm x 6 mm
Flow rate for WP 2 & 3	Up to 0.1 mL/min
Flow rate for WP 4	Up to 10 mL/min
Temperature & pressure	Up to 200ºC and 20 bar
Reactor shape and connections types	Plate based. Channel shape will depend on selected manufacturing technique. Low aspecto ratio channels with a D-shape or V-shape will be targeted
Reactor material	Glass (>280nm) Borofloat BF33 is selected to match required wavelength. Holder materials of construction selected to suit immobilization technique & process. 1st prototype 6/32" threated ports are foreseen. 2nd prototype ¼-28 UNF ports are foreseen for the process & M16x1 for the termal control

0.6 M = 2.6



Mokhtari, Kahila. (2016). Chemical Alteration Of Oil Well Cement With Basalt Additive During Carbon Storage Application.

What do we need?

Flow(s), Pressure(s), Temperature(s) constraints –low flow-high P, and T constraint

Flow and reactor specifications	
Reactor size	1st prototype: 25 mm x 50 mm x 1.5 mm 2nd prototype: 150 mm x 150 mm x 6 mm
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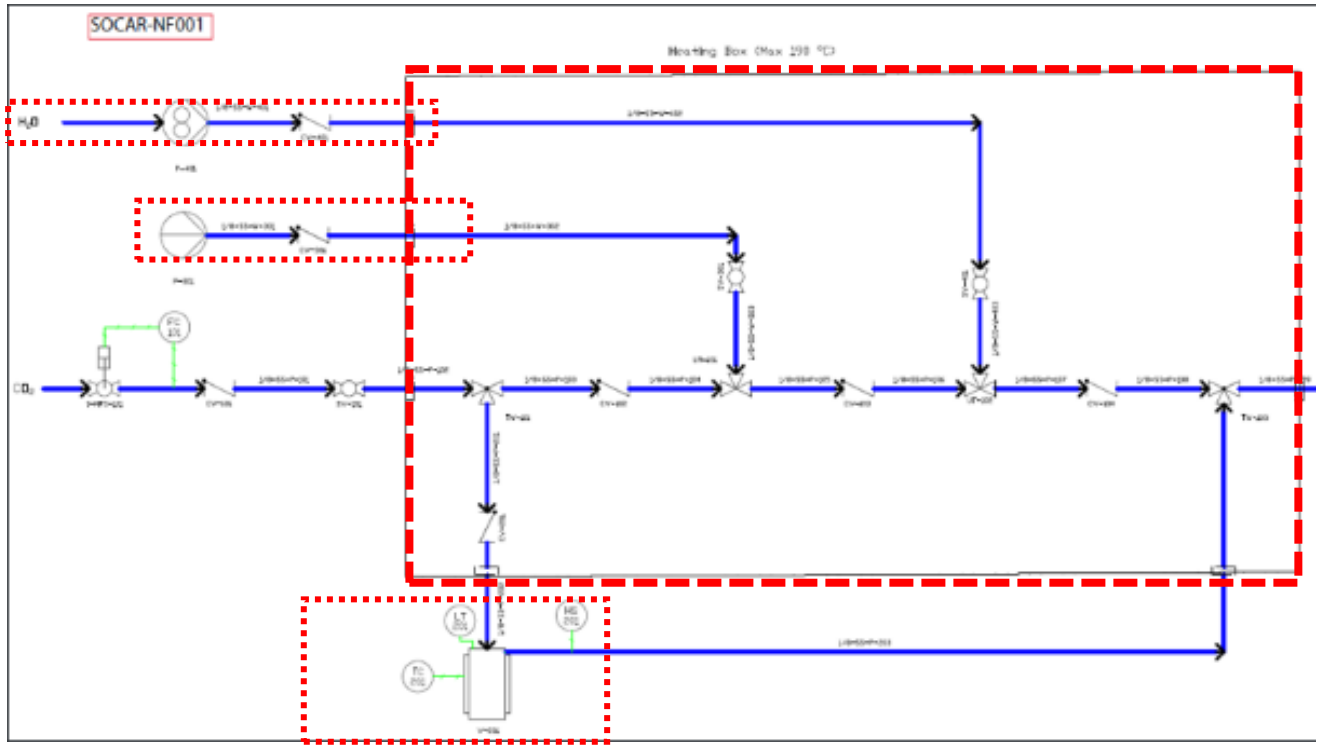
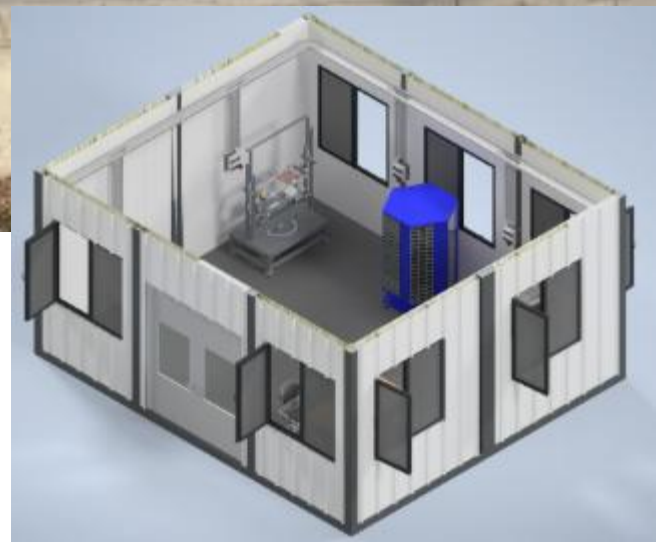


What do we need?

Mobility –LEITAT design, flexible tubing, enclosure design

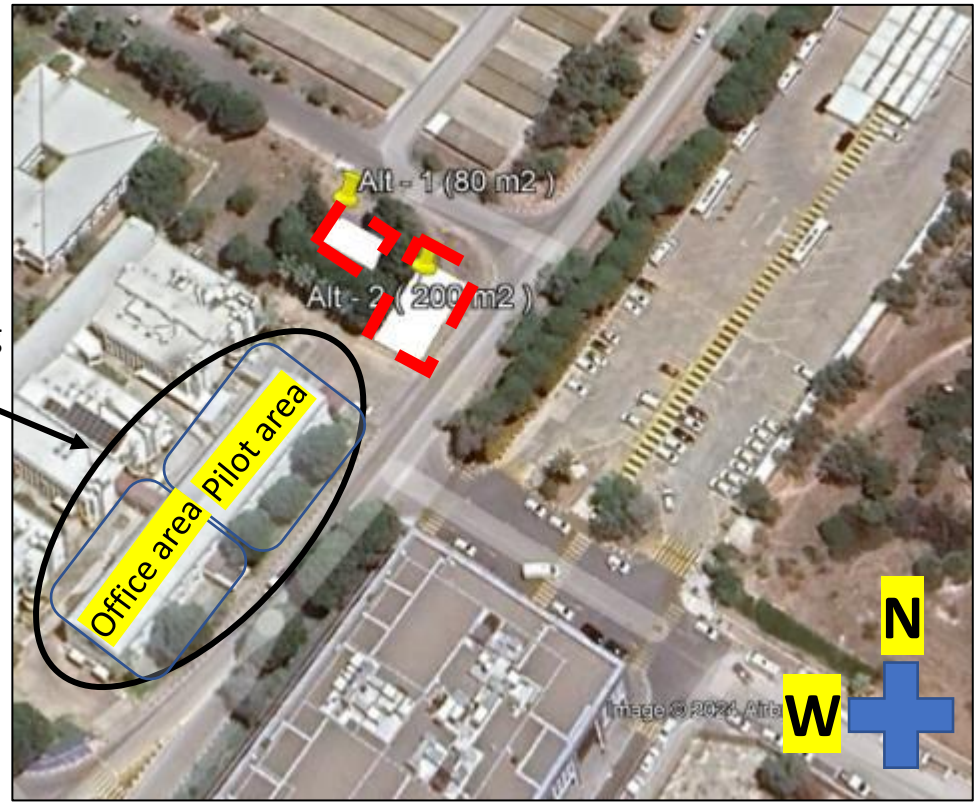
Photo courtesy: LEITAT

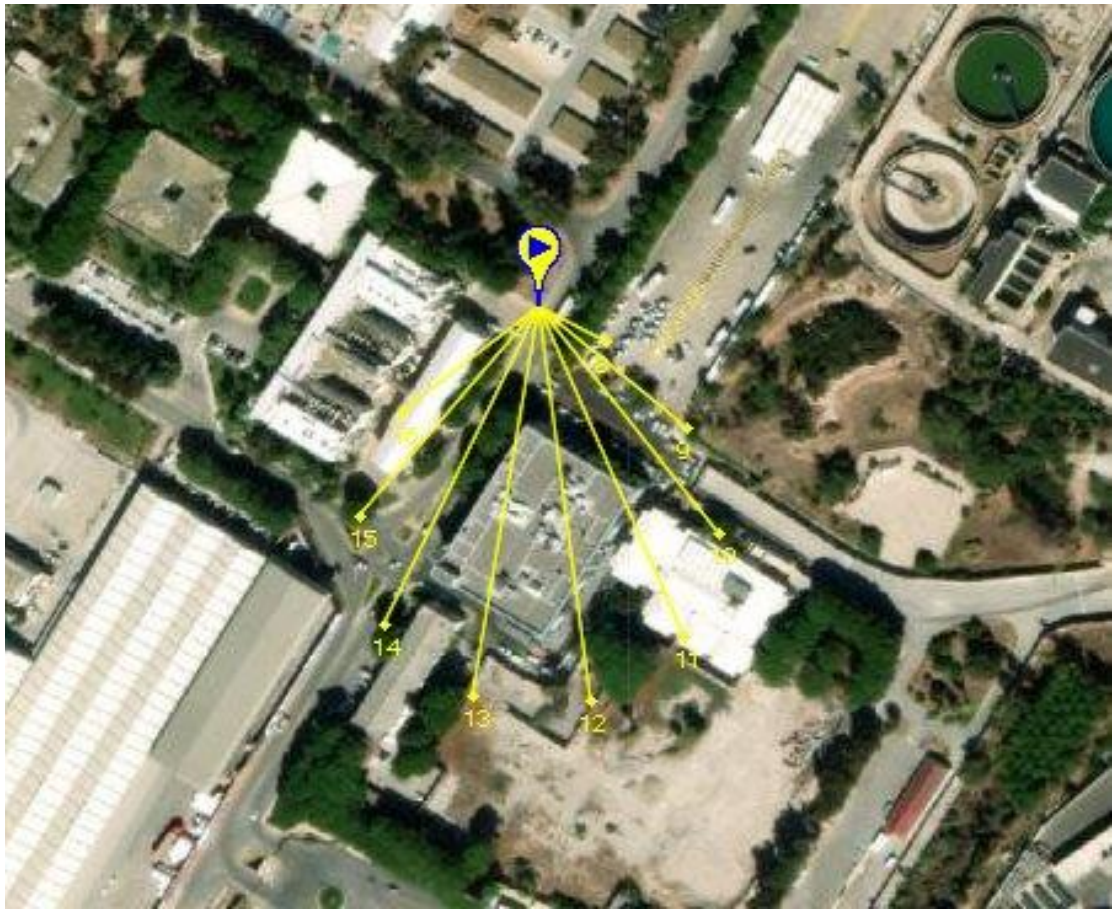


SOCAR’s case

Where to demo? –how to select the area, constraints, concerns, rules, etc.

SOCAR R&D building





SOCAR’s case

Steering a big ship –construction, procurement, internal alignment
Plan Z –exchanging money with time
Integration –unforeseen items (MOC), pfd iterations
Region specifics –customs, other non-EU stuff

Celal Güvenç OĞULGÖNEN
Elif Hanım merhaba, Y... Gönderilmiş Ö...

Elif ÇELİK BODUR
Celal Bey Merhaba, İlgili d... Gelen Kutusu

Serkan DENİZ
Dear Sender, Thank you f... Gelen Kutusu

Celal Güvenç OĞULGÖNEN
Elif Hanım merhaba, ... Gönderilmiş Ö...

Elif ÇELİK BODUR
Celal Bey Merhaba, Ekli fo... Gelen Kutusu

Elif ÇELİK BODUR
Celal Bey Merhaba, Ekli fo... Gelen Kutusu

Deniz ÜÇER
Celal Bey Merhaba, Eşya ç... Gelen Kutusu

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Deniz Hanım merhab... Gönderilmiş Ö...

Deniz ÜÇER
Celal Bey Merhaba, Gelec... Gelen Kutusu

Celal Güvenç OĞULGÖNEN
Deniz Hanım merhab... Gönderilmiş Ö...

Flow History

User	Event		
CELAL GÜVENÇ OĞULGÖNEN	Başlat		
CELAL GÜVENÇ OĞULGÖNEN	Gönder		
BAŞAK TUNCER	Belgeyi Düzenleyene Geri Yol		
CELAL GÜVENÇ OĞULGÖNEN	Gönder		
BAŞAK TUNCER	Formu İlerlet		
İBRAHİM DOĞAN	İç Dağıtım		
AYTAÇ DEMİRELLİ	Formu İlerlet	28.04.2021 09:57:51	23.06.2021 11:50:51
İBRAHİM DOĞAN	Formu İlerlet	23.06.2021 11:50:51	23.06.2021 11:56:48
İBRAHİM DOĞAN	Notification done	23.06.2021 11:56:48	
CELAL GÜVENÇ OĞULGÖNEN	Notification done	23.06.2021 11:56:48	
UTKU ÖZALTAY	İç Dağıtım	23.06.2021 11:56:48	5.07.2021 10:28:18
AYDIN ÇEVİK	Formu İlerlet (Projeye Gönder)	5.07.2021 10:28:18	17.08.2021 16:43:45
UTKU ÖZALTAY	Notification done	17.08.2021 16:43:45	
ERGUN BİNBOĞA	Notification done	17.08.2021 16:43:45	
AFGAN GULİYEV delegated BAHATTİN PALAZ	İç Dağıtım	17.08.2021 16:43:45	17.08.2021 16:57:55
ÇAĞRI KUNDAK	İç Dağıtım	17.08.2021 16:57:55	18.08.2021 09:49:54
ATALAY DEMİRÖZLÜ	İç Dağıtım	18.08.2021 09:49:54	2.09.2021 14:34:31
ÇAĞRI KUNDAK	Formu İlerlet (Fizibiliteye Gönder)	2.09.2021 14:34:31	6.09.2021 18:28:40
ONUR CAN KARTOĞLU	Formu İlerlet (Yatırım Değerlendirmeye Gönder)	6.09.2021 18:28:40	7.09.2021 08:40:53
ALPER AKAY delegated ALİ CAN GÜNDÜZ	Bütçe Kabulü	7.09.2021 08:40:53	6.12.2021 17:19:28
CELAL GÜVENÇ OĞULGÖNEN	Notification done	6.12.2021 17:19:28	
Workflow	Bitti	6.12.2021 17:19:28	


SOCAR
AR-GE VE İNOVASYON MERKEZİ

THANK YOU