Business development in the geothermal energy sector

Opportunities for German-Turkish interaction and co-operating

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Overview

Content

- Brief company presentation
- Geothermal potential of Turkey and insights for activities
- Examples and possibilities for networking and bilateral collaboration from German view
- Tips for bilateral interacting
- Conclusion

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Brief company presentation

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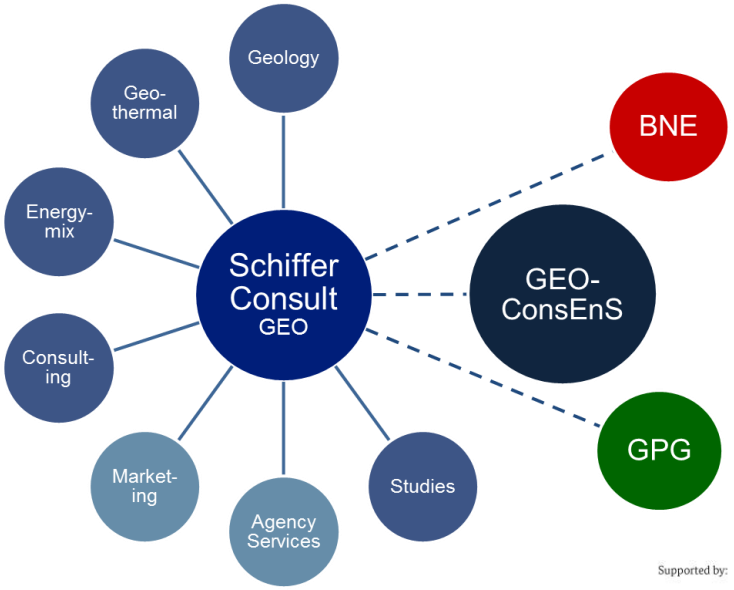
Schiffer Consult - GEO · Services

International geoscientific and technical consulting
in geology, renewables, infrastructure, resources, hydrogeology, environment, conversion management, health and safety

Geothermal sector (extract)

- Project and management consultancy
- Studies, assessments / due diligence
- Project and business development
- Marketing
- Agency services
- Customer relationship management
- Services



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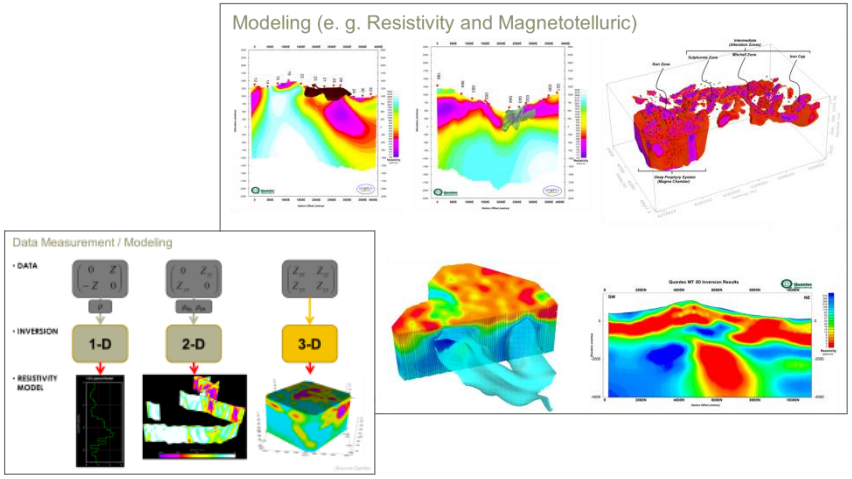
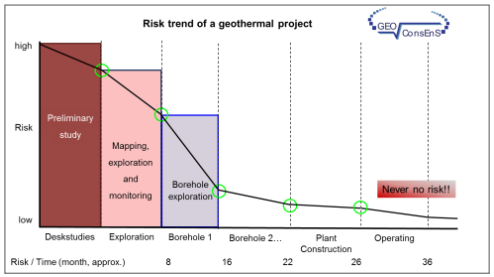
Offers and benefits for Turkish geothermal market (extract)

Consultancy and expertise often covering

- ✓ Specialist consultancy (e.g. geo…, exploration, drilling/stimulation)
- ✓ System solutions and risk management
- ✓ Project evaluation and assessment
- ✓ Second (2nd) opinion reporting
- ✓ Due diligence (technical, economical)
- ✓ Project and business development
- ✓ Management consultancy
- ✓ Marketing services

  in special case: venture financing & funding





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Geothermal potential of Turkey and insights for activities

Picture: SC · SGS, SCHIFFER, R.

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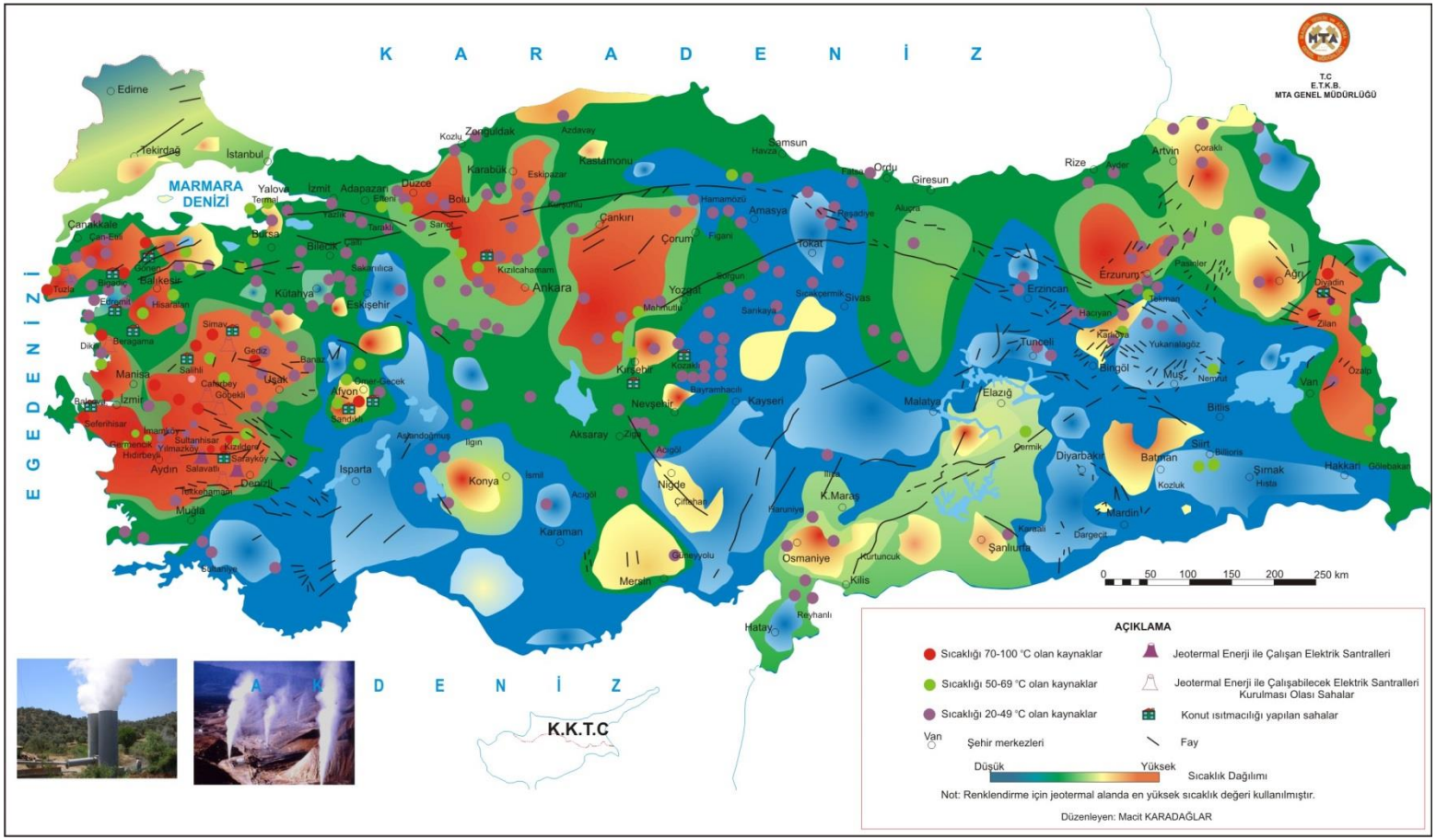
MTA geotermal map of Turkey



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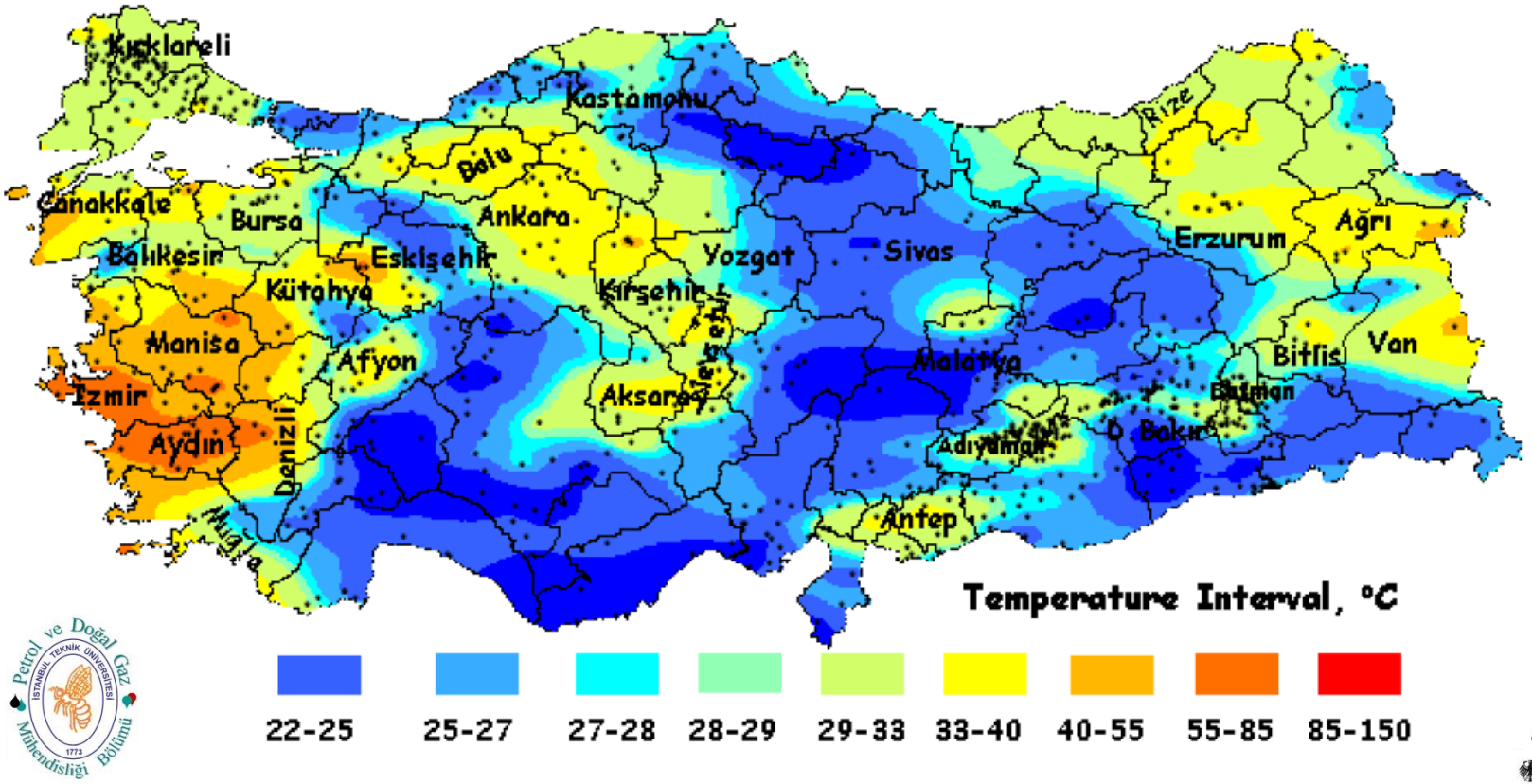
Temperature model of Turkey (500 m)



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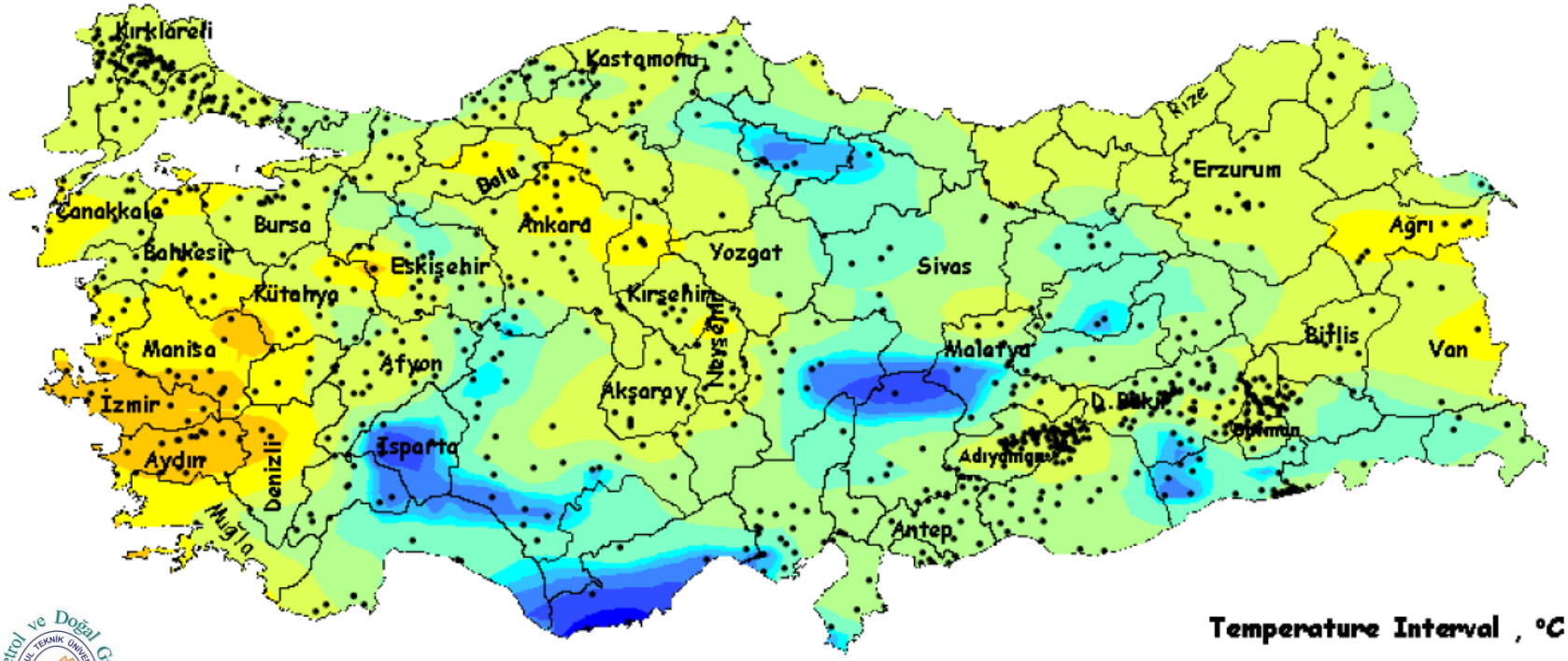
Temperature model of Turkey (1000 m)



Petrol ve Doğal Gaz Mühendisliği Bölümü

İstanbul Teknik Üniversitesi 1773

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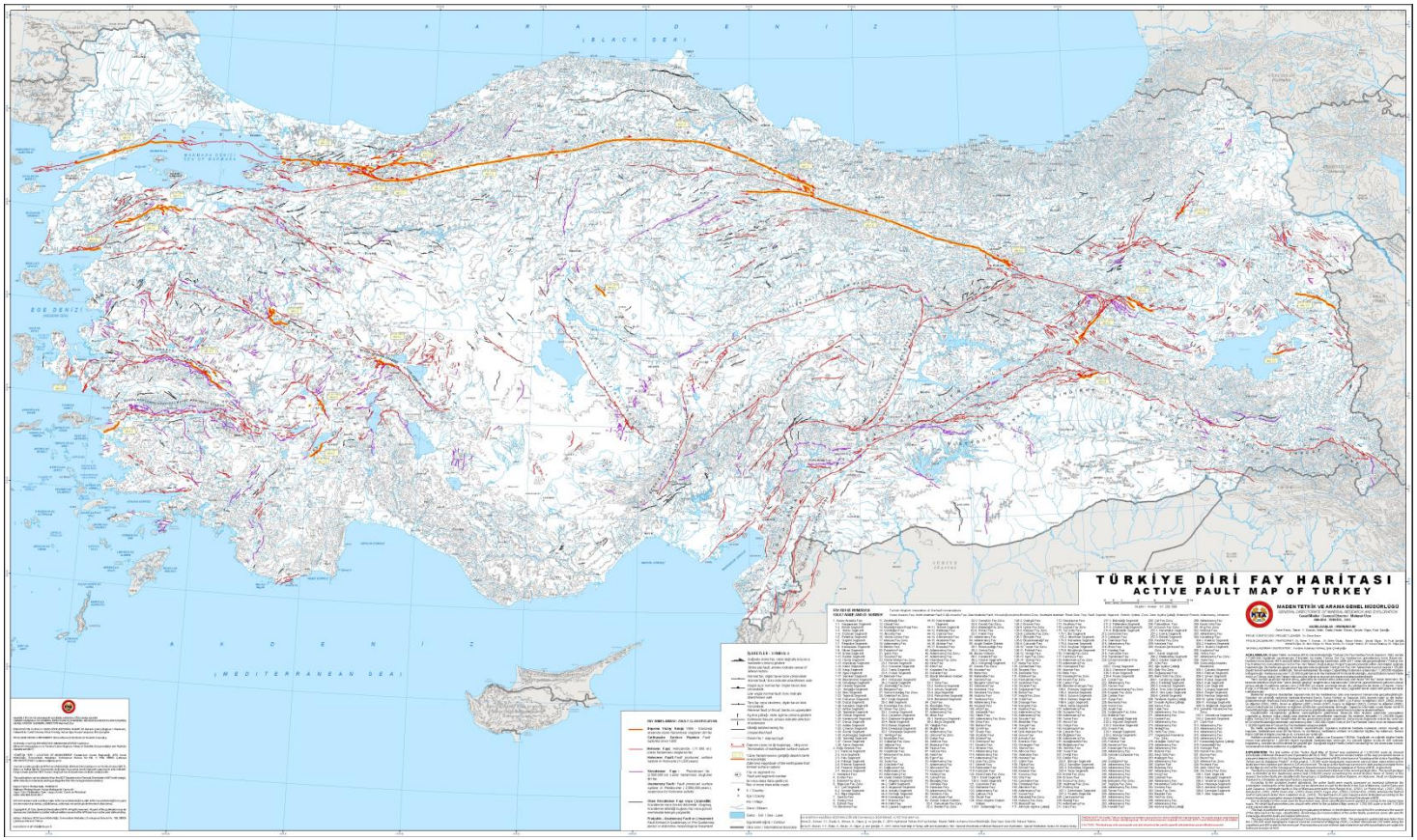
Tectonics - Western Turkish Aegean / Mediterranean region and Central Anatolia



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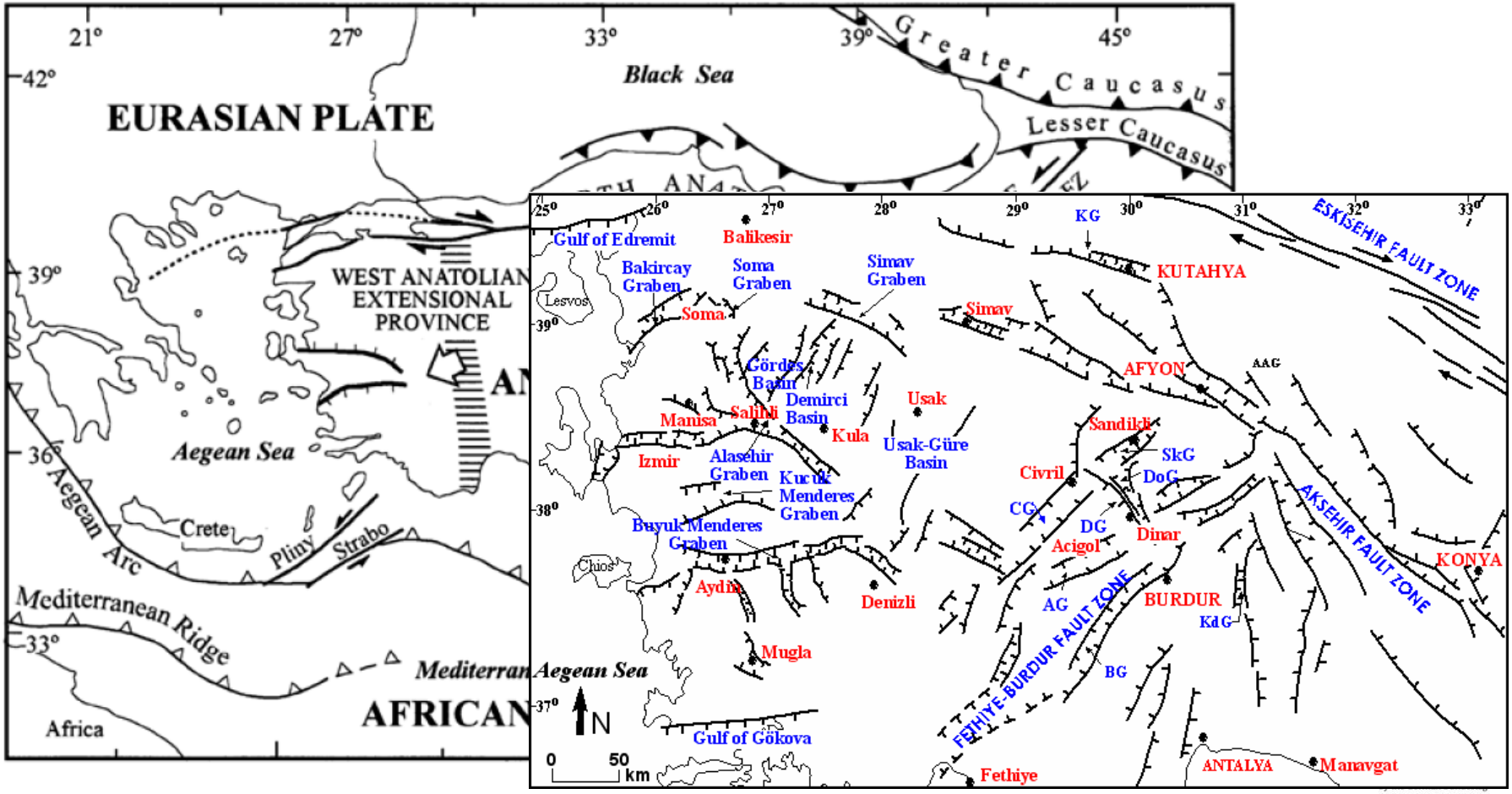

Source: Bozkurt (2001)

Geothermal potential of Turkey

- 227 geothermal fields in use and development
- 2,000 hot and mineral water resources (Temperature range 20 °C to 287 °C)
- Drilled: ~ 1,200 geothermal exploratory, production and reinjection wells
- Geothermal heat capacity potential estimated 2015: 60,000 MW_{th} (2010: 31,500 MW_{th})
- Installed geothermal heat capacity ~ 2,880 MW_{th} in direct use incl. heat pumps
- Installed geothermal power production ~ 500 MW_{el} (09/2015)
- Total geothermal technical and economical electricity potential: 2,000 MW_{el}
  (hydrothermal 0–3 km, next 15 – 20 years, incentive 0.105 US-$)
  theoretical: 4,500 MW_{el}
- Estimated technical EGS electricity production potential 250,000 MW_{el} (petro-thermal , 3-5 km)
  Total EGS electricity production technical and economical potential 25,000 MW_{el}
  (estimated next 20 years)

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Thermal applications – status and possibilities (for development)

Pictures: top: SC· SGS, SCHIFFER R ; bottom: topnews.in; formanfarms.ca; attensaat.de; www.geziyerleri.org

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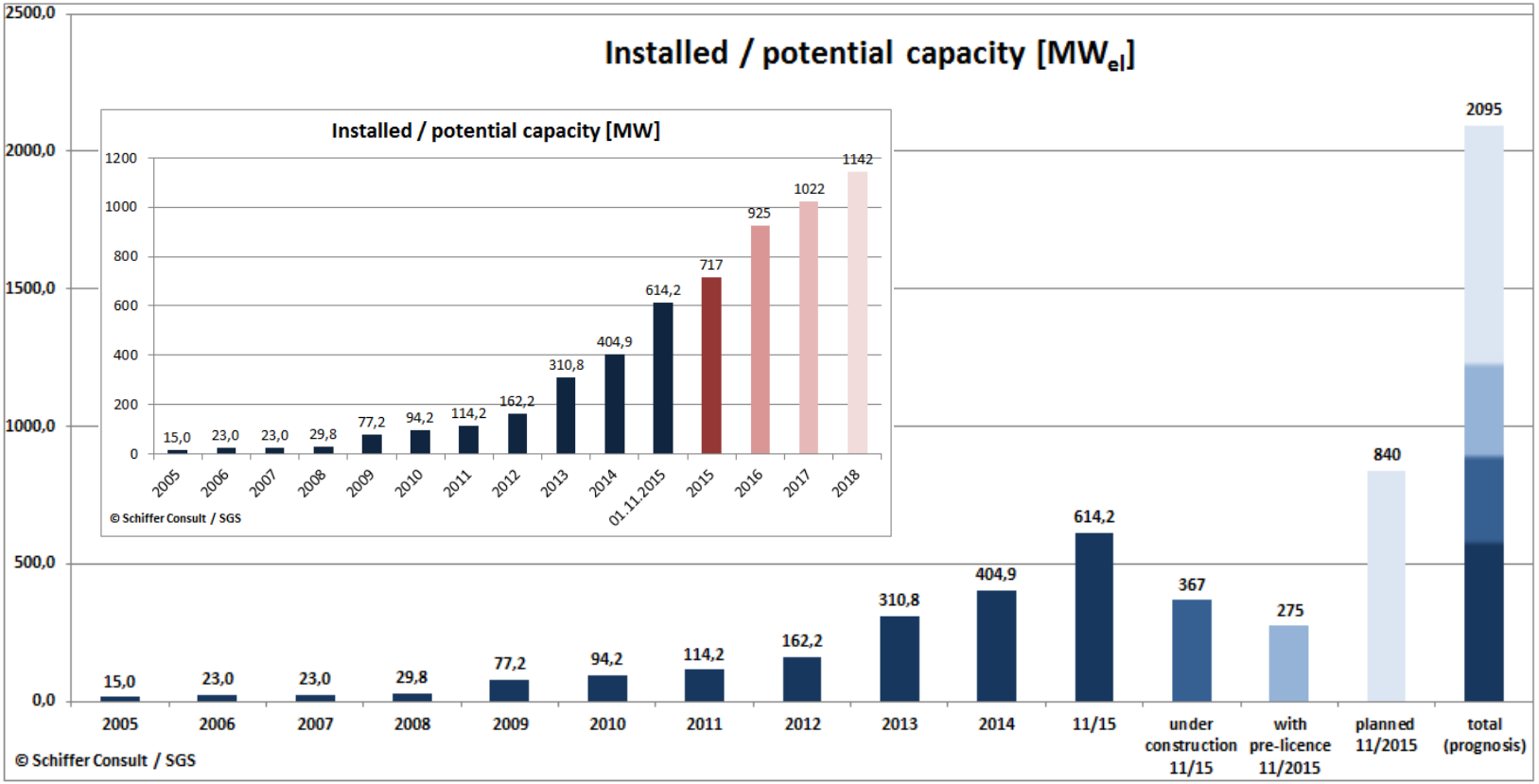
Geothermal Status (recent)



Data based on TEIAŞ, Enerji Atlasi and ERMA 11/2015 added by company information

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Turkish producer of geothermal electricity

Producer	Existing plant capacity [MW_{el}]
Güriş Holding	162,3
Zorlu Enerji	128,7
Maren Enerji	116,0
Çelikler Jeotermal	90,0
MB Holding	51,5
Türkerler Jeotermal	24,0
BM Holding	13,2
MTN Enerji	8,0
Enda Enerji holding	7,5
Bereket Jeotermal Enerji	6,9
Akça Enerji	3,8
Karadeniz Holding	2,3
Sum	**614,2**

Data based on Enerji Atlasi 11/2015

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Geothermal direct heat uses (2014)

Summary table of geothermal direct heat uses as of 31 December 2014		
Use	**Installed Capacity** [MW_t]	**Annual Energy Use** [TJ/yr]
Individual Space Heating	420	4635
District Heating	805	8885
Air Conditioning (Cooling)	-*	-*
Greenhouse Heating	612	11580
Fish Farming	-*	-*
Animal Farming	-*	-*
Agricultural Drying	1,5	50
Industrial Process Heat	-*	-*
Snow Melting	-*	-*
Bathing and Swimming	1005	19016
Other Uses (specify)	-*	-*
Subtotal	**2843.5**	**44166**
Geothermal Heat Pumps	42,8	960
TOTOAL	**2886.3**	**45126**
* - no data available		

Source: MERTOGLU, O., SIMSEK S., BASRIRN N. (2015) Country Update Report of Turkey (2010-2015)

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Status in geothermal house heating systems in Turkey

Place Name	Number of Residential Equivalence (RE) heated	Geoth. water temp (°C)	Investor
İzmir – Balçova + Narlıdere	34100	125-145	Provincial and Municipal Administration Equal Weighted Joint Stock Company
Gönen	2500	80	Weighted Municipal Corporation
Simav	7500	167	Municipality
Kırşehir	1800	57	Special Provincial Administration of the Municipal Corporation Weighted
Kızılcahamam	2500	80	Weighted Municipal Corporation
Afyon	8000	95	Special Provincial Administration of the Municipal Corporation Weighted
Kozaklı	3000	90	Weighted Municipal Corporation
Sandıklı	6000	70	Weighted Municipal Corporation
Diyadin	690	70	Special Provincial Administration
Salihli	7292	94	Municipality
Sarayköy	2200	140	Weighted Municipal Corporation
Edremit	4881	60	Municipality+Private Sector Company
Bigadiç	1950	96	Municipality
Sarıkaya	550 (not operated)	50	Special Provincial Administration + Municipality + Private Sector
Yozgat-Sorgun	1500 (not operated)	80	Municipality
Yerköy	1500 (not operated)	55-60	Special Provincial Administration + Municipality + Private Sector
Güre	650	55	Municipality
İzmir – Dikili	2500	99	Municipality
İzmir – Bergama	450	60	Municipality

Source: DAGISTAN H. et al.(2015) - Geothermal Explorations and Investigations by MTA in Turkey

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Possibilities for geothermal HP applications

Regional rating for Turkey

Marmara Region

Heating (%50) + Cooling (%50)

- Most crowded region in Turkey
- Big residential, commercial and industrial buildings included
- Depending by "Urban Transformation" law by government
- Region available for new contructions
- Widespread natural gas network

Middle Anatolian Region

Heating (%70) + Cooling (%30)

- Capital city of Turkey in this region
- Many governmental buildings, hotels
- Open for construction sector and new buildings
- Low outdoor temperatures
- Widespread natural gas – coal systems

Aegean & Mediterranian Region

Heating (%30) + Cooling (%70)

- Best region for AWHP depending by outdoor tempreatures
- Small size houses, available for pratic installation
- Many vacation places and hotels
- Much rival companies, alternative aplications, cheap units, good aftersales support
- Widespread WRF and other HVAC systems

Eastern and Southeastern Anatolia Region

Heating (%60) + Cooling (%40)

- There is no natural gas web on region
- High mountains and ski facilities for tourism
- Freezy cities in winter time, government supports
- underfloor heating to roads at some cities
- There are many militarial bases on mountains without any heating system
- Region of limits; in winter coldest, in summer hottest places
- AWHP units not fisible
- Widespread natural gas – coal systems

Black Sea Region

Heating (%90) + Cooling (%10)

- There are many touristic facilities and hotels
- Plenty of lakes, rivers and underground water
- Low outdoor temperatures
- No need HPAC module, decrease investment funds
- Low outdoor temperatures , not fisible for AWHP
- Widespread natural gas - coal systems

Source: Dogal Jeotemal Enerji Sistemlerli Ltd.
(Presentation Ö. Azman, Stuttgart October 2015)

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Geothermal projections for 2014 – 2018 of Turkey

Acc. to the 10th development plan (2014 – 2018) of the Turkish Ministry of Development

Geothermal Utilizations	**Government Targets for 2018**	**Additional Investment USD (until 2018)**
Electricity Generation	750 MW_{el} (6 Billion kWh)	2.0 Billion USD
Heating (Residences, Hotels, Thermal Facilities and others)	4,000 MW_{th} (500,000 Residences Equivalence)	1.4 Billion USD
Greenhouse Heating	2,040 MW_{th} (6 Billion m^2)	300 Million USD (including Wells)
Drying	500 MW_{th} (500.000 tons/year)	180 Million USD
Thermal Tourism	1,100 MW_{th} (400 Thermal Facility Equivalence)	1.2 Billion USD
Air conditioning	300 MW_{th} (50,000 Residences Equivalence)	300 Million USD
Aquaculture + others	400 MW_{th}	150 Million USD
Total Direct Use	**8,340 MW_{th}**	**5.53 Billion USD**
Natural Gas Equivalence of all the above mentioned geothermal direct use Utilizations	*6,1 Billion USD/year*	
The economical value added to the Turkey's Economy by means of above mentioned Utilizations until the End of 2018	*32 Billion USD/year*	
The created Employment (Direct and Indirect)	*300,000 Person*	

Source: Turkish Geothermal Association; GEOPOWER Turkey, 10-2013

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Examples and possibilities for networking and bilateral collaboration from German view

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Picture source (overworked): http://www.b4bschwaben.de/cms_media/module_img/401/200699_1_lightbox_Deutsch_tuerkische_Zusammenarbeit_Foto_Ruskpp_iStock_thinkstock.jpg

Networking examples

SGS‘ shares & partners

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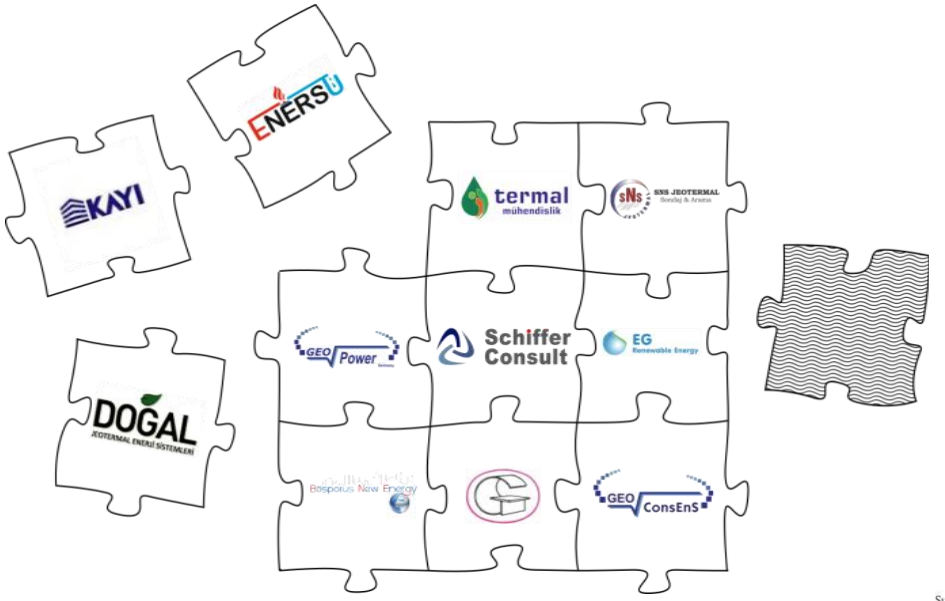
Networking examples

SGS' clients and partnerships relating to Turkish renewable energy / geothermal market



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Networking examples

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

ZIM Zentrales Innovationsprogramm Mittelstand

ZIM network co-operation
(for geothermal market Turkey)


(Source: http://www.heip.fr/wp-content/uploads/2014/06/pedagogie-1024x274.jpg)

Managing & sales company

\+

GG GEOTHERMAL GROUP

found in 11/2015

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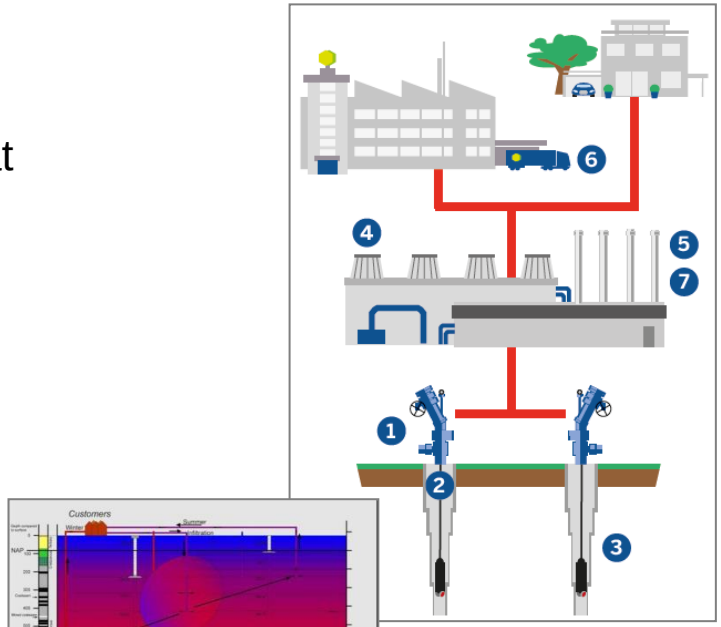
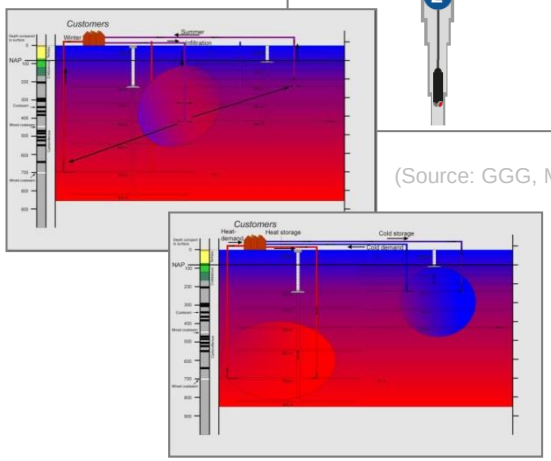
Application examples

- Special technologies, valves
- Special materials, stimulation fluids, borehole heat exchangers
- Exploration, re-processing, data combining
- Power plant technologies, modules
- Project and material management
- Innovative and optimized products and technologies
- Consultancy and project realization - projections: increase of efficiency, parallel / cascade use, storage, intelligent systems and system management

→ Special-purpose solutions





(Source: GGG, Minewater 2.0 project)

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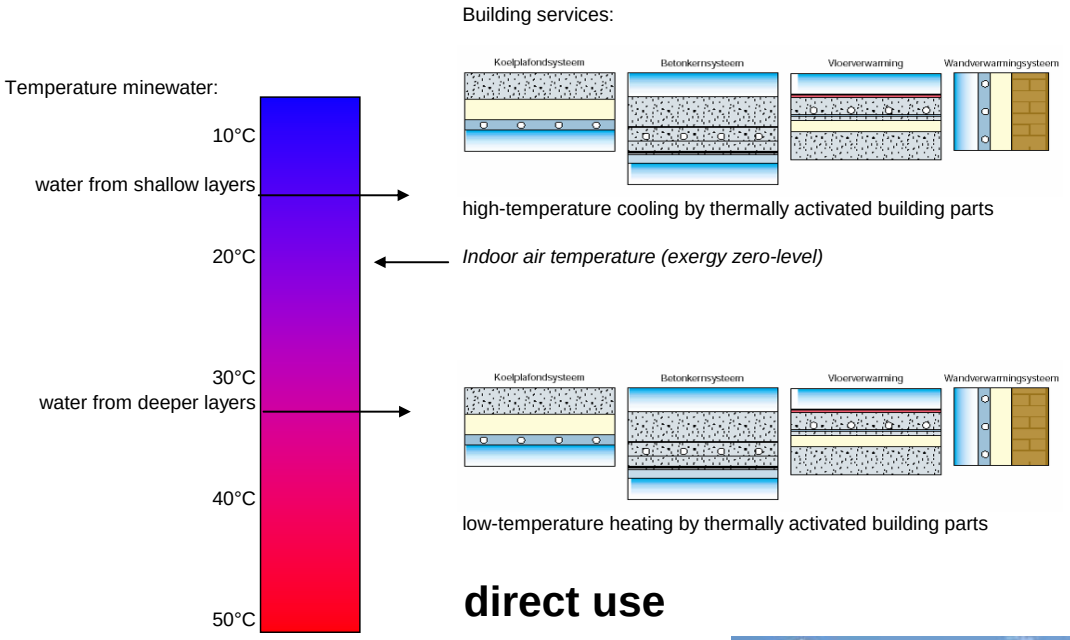
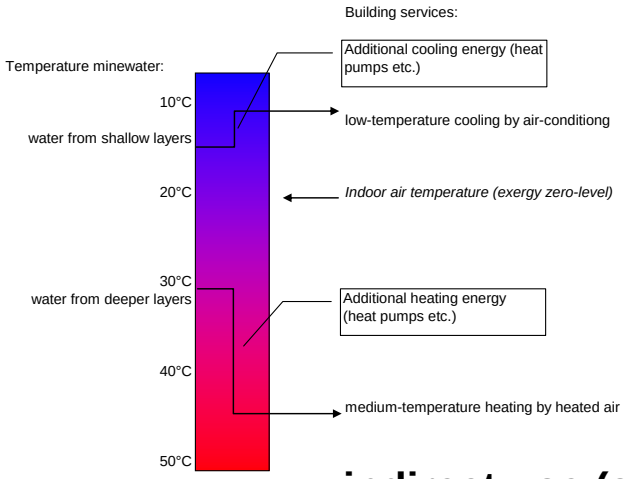
Application - example for low temperature system (cluster) projects

Low enthalpy heating and cooling



direct use



indirect use (ad.)

(Source: Minewater 2.0 project)

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Application - impressions of measuring in geothermal projects

(Picture source: DMT, GAF AG Quantec, Schiffer)

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Tips for bilateral interacting

Picture: SC · SGS, ROITZSCH, T.

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Please consider: “The essence of business relationships is people doing business with people.”

Recommendations for bilateral understanding and interaction

Try to arrange yourself with

- finding acceptance for traditional or typical attributes, practices and behaviours,
- preferred personal communication and the widespread compliance of individual rules,
- values and morals - rooted in education and culture,
- different communication styles - more objective or emotional and relational communication and acting - aiming and basing on trust.

It needs "quite a bit of time" to build up the necessary confidence or even friendship for a successful co-operation. – Hang in there!

German prefer	**Turkish** prefer
long term benefit and economy	practical result in a short run
quality	applicability
steady	flexible
parity	hierarchy
objective, factual trust *“Zahlen, Daten Fakten”*	individual trust
scheduled	open *“hayırlısı”*
precise and direct wording	global and indirect wording
recheck of information flow	assume of information flow
Consequence	
flurry due to “less information”	irritated due to “waste information”

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Conclusion

Picture: SC · SGS, SCHIFFER. R.

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Conclusion

A good base for a joint business development in the geothermal energy sector by German-Turkish interaction and co-operating

Good conditions for the geothermal development in Turkey

- High geothermal energy potential
- High acceptance for geothermal projects
- Support of the renewables by the Turkish government
- One of the fastest growing geothermal markets worldwide
- Possibilities for further development beside hydrothermal utilization with multiple entries and interests in co-operations, e. g. by creating system solutions and/or parts of it for optimizing
- Requests and needs for heating (and cooling)
- Local and international investments in geothermal energy
- Attractive partners on both sides

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