

Renewable Energy and Energy Efficiency at GE

Mete Maltepe

GE Energy

General Manager, Turkey

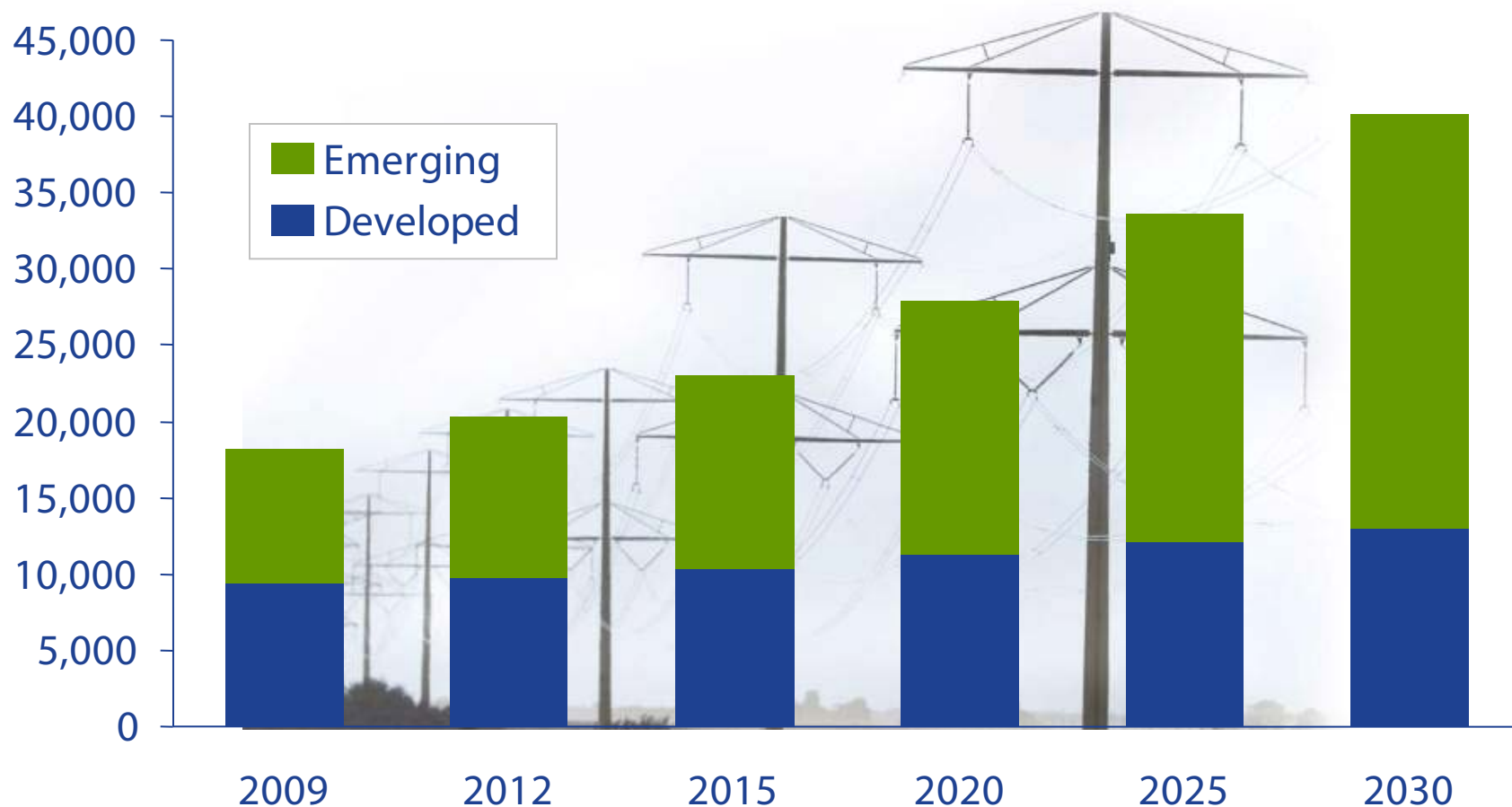
Washington, D.C.

Oct 31, 2011



Global electricity demand

Billions of kW hours



2X by 2030

Source: GE Energy outlook October 2009

2

Today



2030



Renewable energy

GE Renewables ...Wind and Thin Film Solar



World's most efficient, reliable wind turbine fleet

- 17,000+ units ...27GW+
- 98%+ availability ...↑13 pts
- Energy capture ↑50%



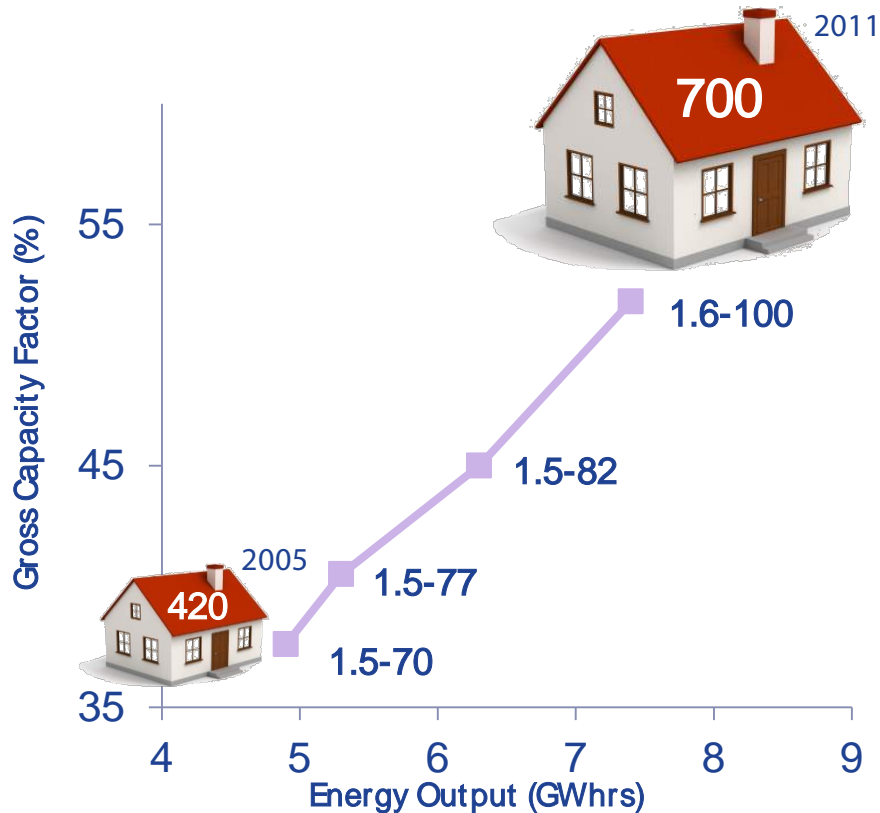
Investing in differentiated thin film solar

- Record thin film solar efficiency
- 400MW U.S. solar factory announced
- Acquisition of PrimeStar and Convertteam

GE wind product advancements

U.S. homes powered
per turbine

Wind speed = 7.5 m/s



1.6-100

- Best in class efficiency
- “Game changing” capacity factor
- 2GW+ deals (since May ‘11 launch)

2.75-103

- Land constrained solution
- Energy production ↑30%+
- World’s largest farms:
Oregon: 845MW
Romania: 600MW



GE wind turbine sites in Turkey

30 MW Bandırma 20 x 1.5-70

135 MW Osmaniye 54 x 2.5-100

30 MW Bergama 12 x 2.5-100

57.5 MW Samandağ 23 x 2.5-100

22.5 MW Çanakkale 9 x 2.5-100

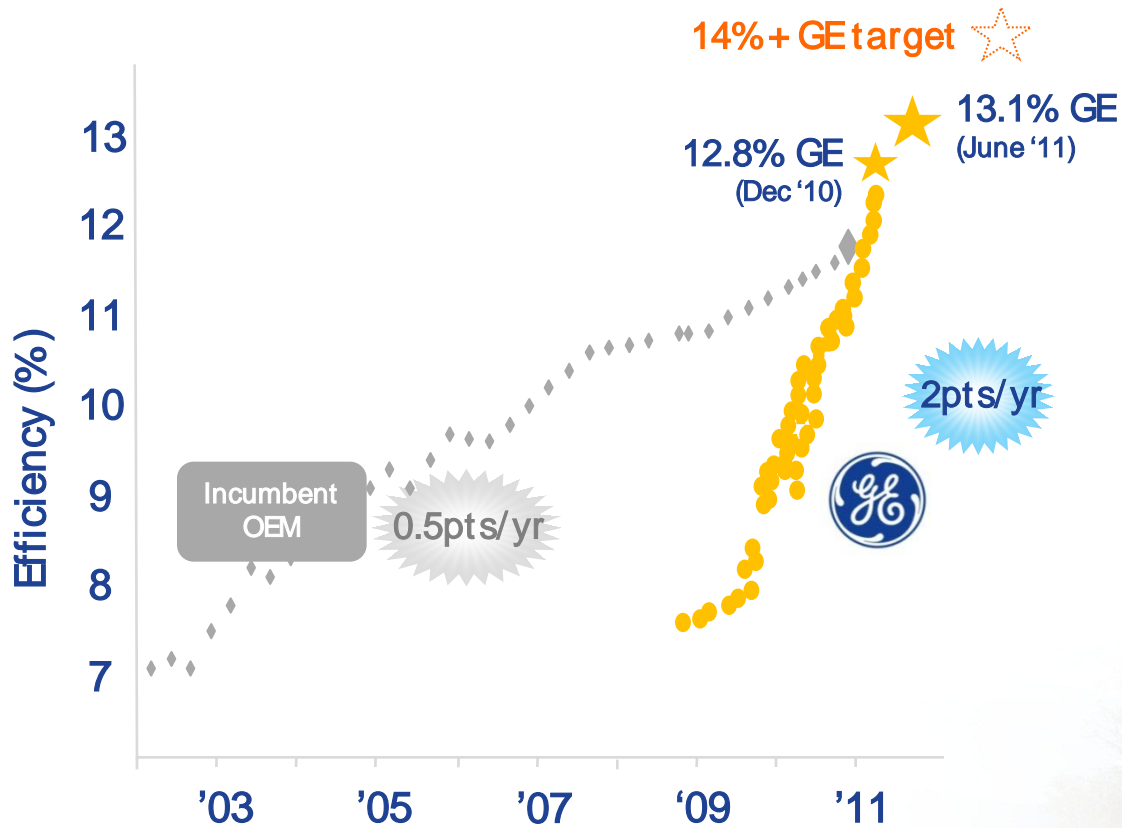
10 MW Aliağa 4 x 2.5-100 *

142.5MW Balıkesir 52 x 2.75-103 *

* Under construction

427.5 MW Operating or Under Construction

GE solar thin film leadership



Differentiated large scale solar

Thin film panels

Record efficiencies ...superior energy capture

Power electronics

Reliable, 17,000+ running in wind ...smarter grid integration



Solar power plant

Scalable 1MW blocks ...low system cost, faster installation



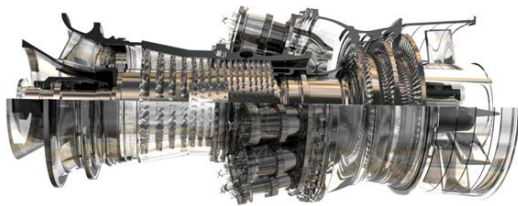
Integrated solar combined cycle

GE alliance with eSolar

Integrated solar combined cycle and concentrated solar plants



- Leading-edge GT technology
- 100+ year ST experience
- Strategic equity investment



- Proven solar technology
- Unique modular, scalable design
- Rapid installation
- Advanced control/ optimization software



Working to deliver integrated technology solutions

FlexEfficiency* 50 Combined Cycle Power Plant

510 MW, 50 Hz... **61%+** baseload efficiency

Start-up to full load **<30 minutes**

Ramp-rate **>50 MW/minute**

Plant turn-down to **40% load**

IRCC Efficiency up to **70%**

A new standard in **efficiency AND flexibility** enabling integration of more renewable resources onto the power grid

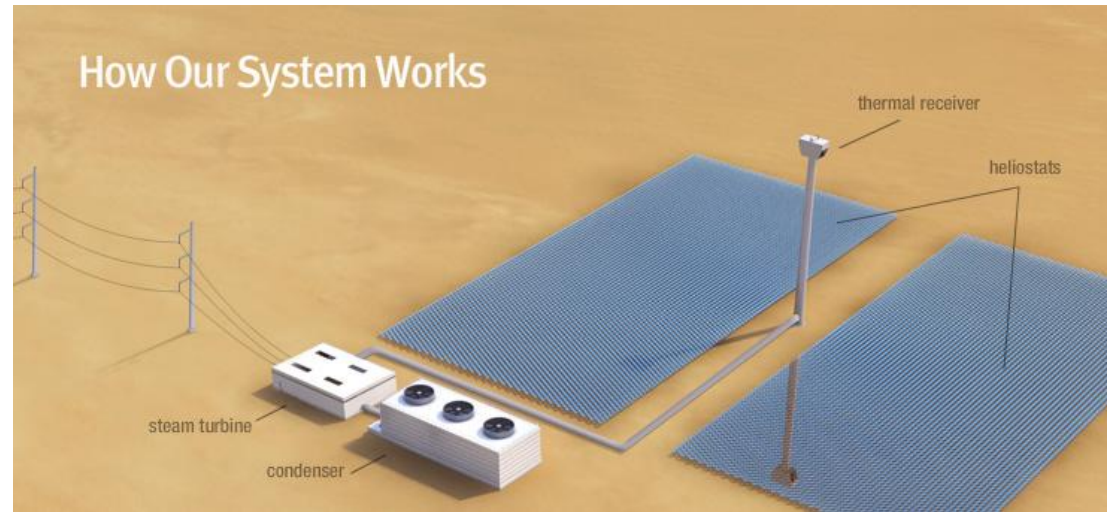


a product of
ecomagination

* Trademark of General Electric Company

ISCC Concept

- Field of sun-tracking heliostats reflects sunlight to thermal receiver atop tower



- Steam raised / piped to combined cycle power plant
- Up to 70% efficiency in ISCC

5-MW Sierra Commercial Demonstration Unit

- Proven technology demonstrated at scale
- On-line since 2009 in Lancaster, CA
- Larger installations through modular replication



B&W External Receiver



MetCap Dervish Project – Karaman, Turkey



midwestmodel.com

Energy efficiency

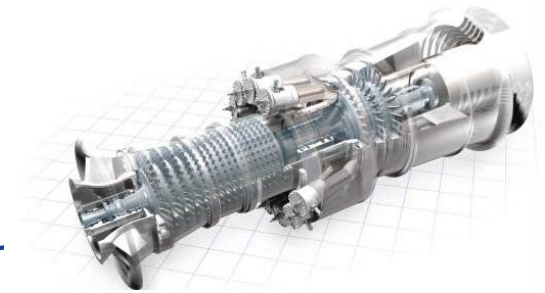
Energy Efficiency

- Energy efficiency is largely recognized as **demand-side** management (DSM), e.g. energy efficient appliances, homes and buildings
- Significant opportunities with **supply-side** efficiency
- Supply side efficiency: **use less fuel and provide more output**

Turbine upgrades are a good start ...

a one-percentage point improvement in efficiency applied to GE's existing F Class fleet would result in...

- CO2 emissions reductions of 4.4 MM tons /year
- Billion dollars+ per year in fuel savings



Source: GE Energy, Global Strategy and Planning, 2009

...but many more opportunities exist:

Combined Heat & Power (CHP)



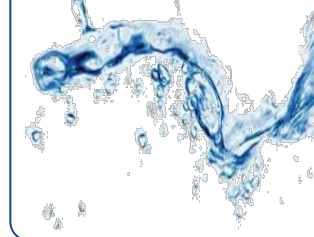
Wind re-powering



Waste Heat Capture



Water re-use



Motors & Pumps



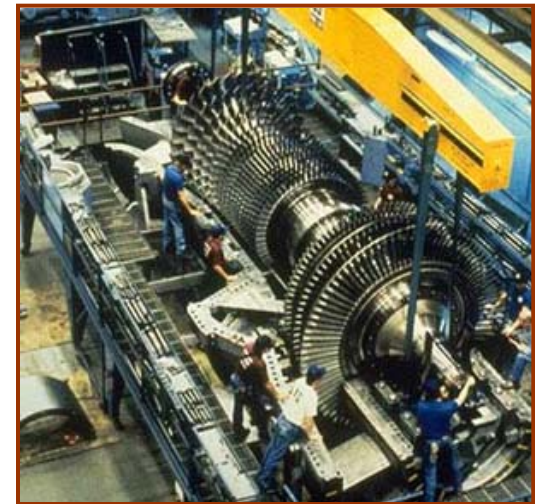
ENKA Power Efficiency Upgrade

Cooling Optimization Package



GE Energy developed an efficiency improvement upgrade called “Cooling Optimization Package (COP)” and the first global implementation and validation was accomplished with ENKA Power of Turkey in 2008 and 2009 on all 10 Frame 9FA gas turbines (Gebze, Adapazarı and Izmir plants).

- ➔ 35 MW increase in plant output
- ➔ 0.6% age point increase in plant efficiency





Thank you for your attention