

Committee on Advanced Technologies for Gas Turbines
First Meeting
December 17-18, 2018

Keck Center of the National Academies

Room 208

500 Fifth St. N.W.

Washington, D.C.

(parking garage entrance on 6th St. NW between E St. and F St. NW)

AGENDA

Meeting Goals--Open Sessions

1. Understand sponsor expectations for the study.
2. Identify potential key opportunities for improving gas turbines for each class of turbine under investigation.

Meeting Goals--Closed Session

1. Identify potential key issues to be investigate in detail.
2. Plan for report preparation: Establish working groups and working group leads.
3. Plan second meeting.

Monday, December 17

Open Session

Time	Duration Hrs : Min		
7:30 AM	0:30	Breakfast available in meeting room	
8:00 AM	0:15	Welcome and Introductions	Ed Crow and Tresa Pollock, Co-chairs Alan Angleman, Study Director
8:15 AM	0:45	Sponsor Expectations	Rich Dennis, DOE

Panel 1. Key Opportunities to Advance Gas Turbines for Oil and Gas Production and Transmission

Focus Questions for Panel 1: What are the key opportunities for improving and creating advanced technologies that can be introduced into the design and manufacture of gas turbines to generate electrical and mechanical power for oil and gas production and transmission to enhance turbine performance (particularly with respect to efficiency and life cycle cost) by 2030? (For example, what level of overall thermal efficiency is achievable in this timeframe and what path is most likely to achieve this level of improvement?) To what extent would advanced technologies of interest be relevant to gas turbines for the other two applications of interest (i.e., aircraft propulsion and powering the electrical grid)?

Time	Duration Hrs : Min		
9:00 AM	0:30	Introduction and Overview of Applicable Gas Turbines	Moderator: Bernhard Winkelmann, Committee Member
9:30 AM	1:00	Opening remarks by each panelist (10 minutes each)	Panelists: 1. Klaus Brun, Elliott Group 2. Rainer Kurz, Solar Turbines 3. Narendra Joshi, GE Global Res. Center 4. Marybeth McBain, Kinder Morgan
10:30 AM	0:15	Break	
10:45 AM	1:25	General Discussion	
12:10 PM	0:10	Final Comments by Committee Members	
12:20 PM	0:10	Summary of Potential Key Issues	Bernhard Winkelmann
12:30 PM	0:45	Lunch	

Panel 2. Key Opportunities to Advance Gas Turbines for Aircraft Propulsion

Focus Questions for Panel 2: What are the key opportunities for improving and creating advanced technologies that can be introduced into the design and manufacture of gas turbines for aircraft propulsion to enhance their performance (particularly with respect to efficiency and life cycle cost) by 2030? (For example, what level of overall thermal efficiency is achievable in this timeframe and what path is most likely to achieve this level of improvement?) To what extent would advanced technologies of interest be relevant to gas turbines for the other two applications of interest (i.e., powering the electrical grid and generating electrical and mechanical power for oil and gas production and transmission)?

1:15 PM	0:30	Introduction and Overview of Applicable Gas Turbines	Moderator: Mike Maloney, Committee Member
1:45 PM	1:00	Opening remarks by each panelist (10 minutes each)	Panelists: 1. Mark Zelesky, P&W 2. Mark Wilson, Rolls-Royce LibertyWorks 3. Eric Ducharme, GE Aviation 4. Brian Gleeson, Univ of Pitt (remote) 5. Shawn Gregg, Delta Air Lines
2:45 PM	0:15	Break	
3:00 PM	1:40	General Discussion	
4:40 PM	0:10	Final Comments by Committee Members	
4:50 PM	0:10	Summary of Potential Key Issues	Mike Maloney
5:00 PM		Adjourn for Day	
6:00 PM		Dinner for Committee members at the restaurant in the Hotel Monaco (Dirty Habit)	

Tuesday, December 18

Open Session

Time	Duration Hrs : Min		
7:30 AM	0:30	Breakfast available in meeting room	
8:00 AM	0:10	Welcome and Introductions	Ed Crow and Tresa Pollock, Co-chairs

Panel 3. Key Opportunities to Advance Gas Turbines to Power the Electrical Grid

Focus Questions for Panel 3: What are the key opportunities for improving and creating advanced technologies that can be introduced into the design and manufacture of gas turbines for powering the electrical grid to enhance their performance (particularly with respect to efficiency and life cycle cost) by 2030? (For example, what level of overall thermal efficiency is achievable in this timeframe and what path is most likely to achieve this level of improvement?) To what extent would advanced technologies of interest be relevant to gas turbines for the other two applications of interest (i.e., aircraft propulsion and providing electrical and mechanical power for oil and gas production and transmission)?

8:10 AM	0:30	Introduction and Overview of Applicable Gas Turbines	Moderator: Fred Villeneuve, Committee Member
8:40 AM	1:00	Opening remarks by each panelist (10 minutes each)	Panelists: 1. Geo Richards, DOE National Energy Technology Laboratory 2. Bobby Noble, EPRI 3. Jon Schaeffer, GE Power 4. Joe Citenko, GE Power 5. Frank Ham, Cascade Technologies
9:40 AM	0:15	Break	
9:55 AM	1:45	General Discussion	
11:40 AM	0:10	Final Comments by Committee Members	
11:50 AM	0:10	Summary of Potential Key Issues	Fred Villeneuve
12:00 PM	1:00	Lunch	
1:00 PM		End of Open Session	

Closed Session

1:00 PM	1:00	Discussion of Committee Composition and Balance	Alan Angleman, ASEB Study Director
2:00 PM	1:00	Discussion of Potential Key Opportunities and Report Preparation: <ul style="list-style-type: none">• Which issues will the committee investigate in detail?• How will the report be organized?• How will the committee be organized into working groups to prepare the report and who will lead each group?	Ed Crow and Tresa Pollock, Co-chairs
3:00 PM	0:15	Break	
3:15 PM	0:45	Discussion, continued	
4:00 PM	1:00	Planning for 2nd Meeting: Agenda Organization and Potential Speakers	Ed Crow and Tresa Pollock, Co-chairs
5:00 PM		Meeting Adjourns	

Statement of Task:

The National Academies of Sciences, Engineering, and Medicine will convene an ad hoc committee to identify high-priority opportunities for improving and creating advanced technologies that can be introduced into the design and manufacture of gas turbine engines to enhance their performance (particularly with respect to efficiency and life cycle cost) by 2030. Gas turbine applications of particular interest are as follows:

- o combined cycle gas turbines to generate electrical power, such as:
 - large, stationary turbines to power the electrical grid
- o simple cycle gas turbines to generate electrical and mechanical power, such as:
 - large, stationary turbines to power the electrical grid
 - stationary turbines of various sizes to support oil and gas production and transmission
- o gas turbines for commercial and military aircraft propulsion

The priority of specific advanced technologies shall be based on their breadth of application, the degree of improvement for individual applications, the timeliness with which the technologies could be matured, and other factors to be determined by the committee. The scope of the study shall include compressors, combustion systems, expanders, bearings, seals, instrumentation, and digital twins (i.e., virtual copies of operational gas turbines). In identifying high-priority opportunities for developing advanced technologies of interest, the committee shall consider the performance of current gas turbines and gas turbine components for the applications listed above, the state of the art of relevant manufacturing technologies, and ongoing efforts to develop advanced manufacturing technologies.

The following information is provided for any members of the general public who may be in attendance:

This meeting is being held to gather information to help the committee conduct its study. This committee will examine the information and material obtained during this, and other public meetings, in an effort to inform its work. Although opinions may be stated and lively discussion may ensue, no conclusions are being drawn at this time and no recommendations will be made. In fact, the committee will deliberate thoroughly before writing its draft report. Moreover, once the draft report is written, it must go through a rigorous review by experts who are anonymous to the committee, and the committee then must respond to this review with appropriate revisions that adequately satisfy the Academy's Report Review committee and the chair of the NRC before it is considered an NRC report. Therefore, observers who draw conclusions about the committee's work based on today's discussions will be doing so prematurely.

Furthermore, individual committee members often engage in discussion and questioning for the specific purpose of probing an issue and sharpening an argument. The comments of any given committee member may not necessarily reflect the position he or she may actually hold on the subject under discussion, to say nothing of that person's future position as it may evolve in the course of the project. Any inference about an individual's position regarding findings or recommendations in the final report are therefore also premature.