Clean Sky Joint Undertaking
Call SP1-JTI-CS-2011-01

European Commission
Research Directorates

Call for Proposals:

CLEAN SKY
RESEARCH and TECHNOLOGY DEVELOPMENT PROJECTS
(CS-RTD Projects):

Call Text

Call Identifier

SP1-JTI-CS-2011-01

Part D - SGO

Index

Document track changes

Page/topic	Original	Correction or modification

Specialised and technical assistance:

CORDIS help desk http://cordis.europa.eu/guidance/helpdesk/home_en.html

EPSS Help desk support@epss-fp7.org

IPR help desk http://www.ipr-helpdesk.org

Introduction

Via the Calls for Proposal, Clean Sky aims to incorporate Partners to address very specific tasks which fit into the overall technical Work Programme and time schedule.

Due to the nature of these tasks, the Call is not set up using a set of themes, but it is conceived as a collection of very detailed Topics. The Call text therefore consists of a set of topic fiches, attached here.

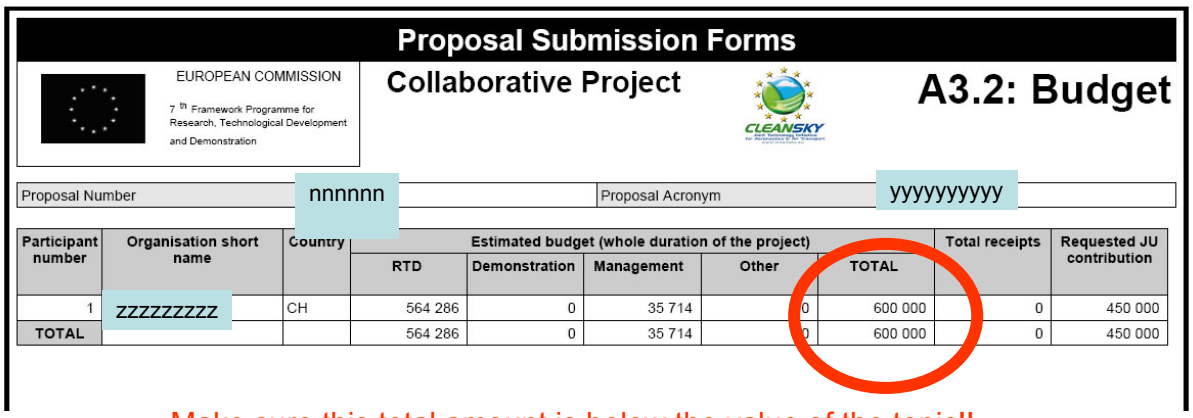
Each Topic fiche addresses the following points:

- Topic manager (not to be published)
- Indicative start and Indicative End Dates of the activity
- Description of the task
- Indicative length of the proposal (where applicable)
- Specific skills required from the applicant
- Major deliverables and schedule
- Maximum Topic Budget value
- Remarks (where applicable)

The maximum allowed Topic budget relates to the total scope of work. A Maximum funding is also indicated.

Depending on the nature of the participant, the funding will be between 50% and 75% of the Topic maximum budget indicated. It has to be noted that the Topic budget excludes VAT, as this is not eligible within the frame of Clean Sky.

Recommendation to applicants:



Proposal Submission Forms

EUROPEAN COMMISSION
7 th Framework Programme for Research, Technological Development and Demonstration

Collaborative Project

A3.2: Budget

Proposal Number	nnnnnn	Proposal Acronym	yyyyyyyyyy

Participant number	Organisation short name	Country	Estimated budget (whole duration of the project)					Total receipts	Requested JU contribution
			RTD	Demonstration	Management	Other	TOTAL		
1	zzzzzzzzz	CH	564 286	0	35 714	0	600 000	0	450 000
TOTAL			564 286	0	35 714	0	600 000	0	450 000

Make sure this total amount is below the value of the topic!!
Better, keep at least 5% margin.
Final amount is to be discussed in the negotiation.

Eligibility criteria

All applicants are requested to verify their actual status of "**affiliate**" with respect to the members of the relevant ITD for whose topic(s) they wish to submit a proposal. Applicants who are affiliated to any leader or associate of an ITD will be declared not eligible for the topics of that ITD.
Refer to art.12 of the Statute (*Council Regulation (EC) No 71/2007 of 20 December 2007 setting up the Clean Sky Joint Undertaking*) and to page 8 of the Guidelines.

Thresholds:

As indicated in section 4.6 of the *"Rules for Participation and Rules for Submission of Proposals and the related Evaluation, Selection and Award Procedures"*, each proposal will be evaluated on 6 criteria.

For a Proposal to be considered for funding, it needs to pass the following thresholds:

- **Minimum 3/5** score for each of the 6 criteria,
  AND
- **Minimum 20/30 total score**

Only one Grant Agreement (GA) shall be awarded per Topic.

Calendar of events:

- **Call Launch: 10 February 2011**
- **Call close: 3 May 2011, 17:00**

- Evaluations (indicative): 23-27 May 2011

- Start of negotiations (indicative): 01 July 2011
- Final date for signature of GA by Partner: 31 August 2011
- Final date for signature of GA by Clean Sky JU: 15 September 2011

Recommendation

The applicant is encouraged to apply for a PIC (Participant Identity Code) and to launch the process of validation as early as possible; this will speed up the process of negotiation in the event that your proposal is successful (see http://ec.europa.eu/research/participants/portal/appmanager/participants/portal)

Contacts:
All questions regarding the topics published in this Call can be addressed to:

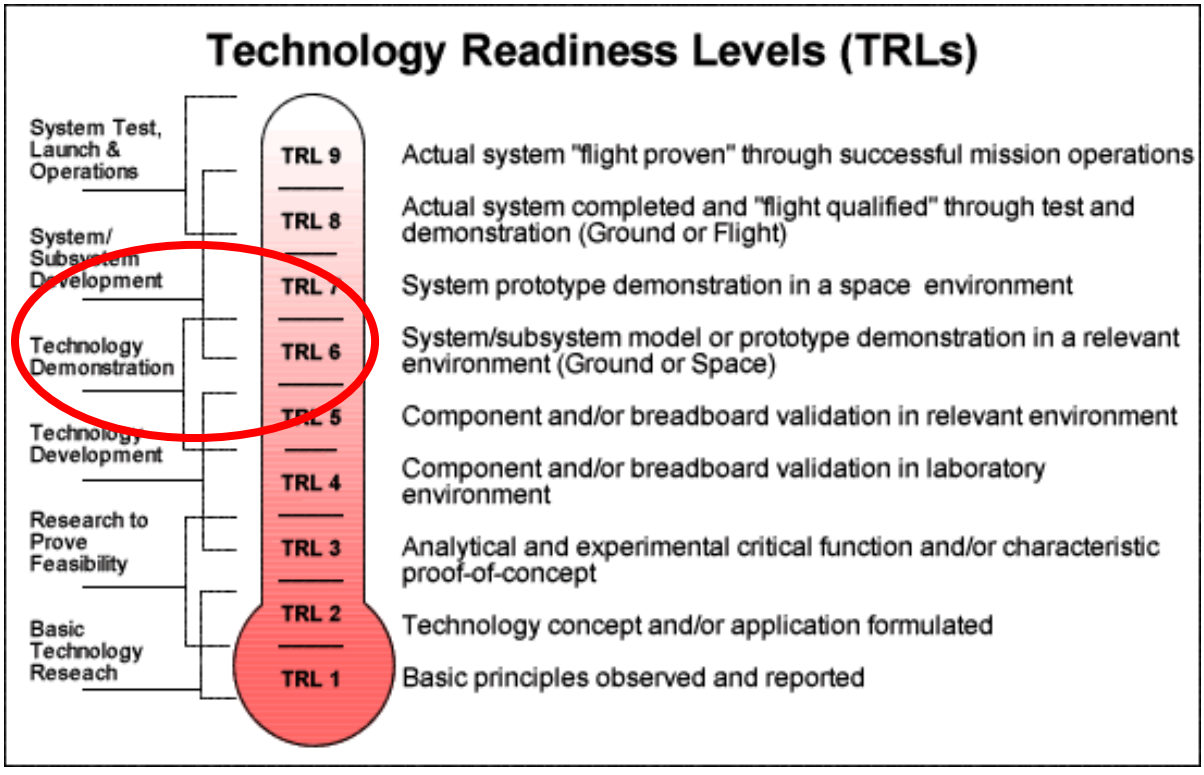
info-call-2011-01@cleansky.eu

Questions received until **25 March 2011** will be considered.

Questions having a general value, either on procedural aspects or specific technical clarifications concerning the call topics, when judged worth being disseminated, will be published in a specific section of the web site (www.cleansky.eu), together with the answers provided by the topic managers.

All interested applicants are suggested to consult periodically this section, to be updated on explanations being provided on the call content.

Reference to TRL:
When applicable or quoted in the text of topics, the applicants should be aware of the definition of Technology Readiness Levels, as per following chart, being TRL 6 the target for Clean Sky for all applicable technologies:



Identification	ITD - AREA - TOPIC	topics	VALUE	MAX FUND
JTI-CS-ECO	**Clean Sky - EcoDesign**	**12**	**6.410.000**	**4.807.500**
JTI-CS-ECO-01	*Area-01 - EDA (Eco-Design for Airframe)*		2.050.000	
JTI-CS-2011-1-ECO-01-018	Environmental Data Models and Interface development		720.000	
JTI-CS-2011-1-ECO-01-019	Borate-free cleaners used in anodizing processes		100.000	
JTI-CS-2011-1-ECO-01-020	Chromate-free sealing of TSA		100.000	
JTI-CS-2011-1-ECO-01-021	Industrialisation Set-Up of Thermoplastics «In situ » Consolidation Process		290.000	
JTI-CS-2011-1-ECO-01-022	Development of flexible inductive thin sheet heating device for FRP repair applications		200.000	
JTI-CS-2011-1-ECO-01-023	To develop recycling technologies of aeronautical composite materials through mechano-physical approaches		140.000	
JTI-CS-2011-1-ECO-01-024	Simplified LCA Tool development		250.000	
JTI-CS-2011-1-ECO-01-025	Production of yarns and fabrics based on recycled carbon fibres (CFs)		250.000	
JTI-CS-ECO-02	*Area-02 - EDS (Eco-Design for Systems)*		4.360.000	
JTI-CS-2011-1-ECO-02-008	Electrical Model of Generic Architecture Electrical Power Distribution		300.000	
JTI-CS-2011-1-ECO-02-009	Alternator with active power rectification and health monitoring		1.700.000	
JTI-CS-2011-1-ECO-02-010	Development, Construction and Integration of Systems for Ground Thermal Test Bench		2.000.000	
JTI-CS-2011-1-ECO-02-011	Heat pipe for critical applications		360.000	
JTI-CS-GRA	**Clean Sky - Green Regional Aircraft**	**6**	**1.330.000**	**997.500**
JTI-CS-GRA-01	*Area-01 - Low weight configurations*		770.000	
JTI-CS-2011-1-GRA-01-035	Smart maintenance technologies		220.000	
JTI-CS-2011-1-GRA-01-036	Development of methodology for selection and integration of sensors in fuselage stiffened panels. Testing scheme,		100.000	
JTI-CS-2011-1-GRA-01-037	Advanced fuselage and wing structure based on innovative alumiunium lithium alloy - numerical trade off study and		450.000	
JTI-CS-GRA-02	*Area-02 - Low noise configurations*		460.000	
JTI-CS-2011-1-GRA-02-015	Advanced concepts for trailing edge morphing wings - Design and Manufacturing of test rig and test samples - Test		210.000	
JTI-CS-2011-1-GRA-02-016	Novel nose wheel evolution for noise reduction		250.000	
JTI-CS-GRA-03	*Area-03 - All electric aircraft*			
JTI-CS-GRA-04	*Area-04 - Mission and trajectory Management*			
JTI-CS-GRA-05	*Area-05 - New configurations*		100.000	
JTI-CS-2011-1-GRA-05-006	Updated Regional traffic scenario to upgrade Requirements for "Future Regional Aircraft".		100.000	
JTI-CS-GRC	**Clean Sky - Green Rotorcraft**	**5**	**3.150.000**	**2.362.500**
JTI-CS-GRC-01	*Area-01 - Innovative Rotor Blades*			
JTI-CS-GRC-02	*Area-02 - Reduced Drag of rotorcraft*			
JTI-CS-GRC-03	*Area-03 - Integration of innovative electrical systems*		2.150.000	
JTI-CS-2011-1-GRC-03-006	EMA for utility consumer systems: EMA for Landing Gear		1.000.000	
JTI-CS-2011-1-GRC-03-007	Innovative Dynamic Rotor Brake		700.000	
JTI-CS-2011-1-GRC-03-008	Innovative High Voltage Energy Storage System for Advanced Rotorcraft Integration.		450.000	
JTI-CS-GRC-04	*Area-04 - Installation of diesel engines on light helicopters*			
JTI-CS-GRC-05	*Area-05 - Environmentally friendly flight paths*		800.000	
JTI-CS-2011-1-GRC-05-005	Integrated ATC/tiltrotor simulation of low-noise procedures and evaluation of the impact on operators		800.000	
JTI-CS-GRC-06	*Area-06 - Eco Design for Rotorcraft*		200.000	
JTI-CS-2011-1-GRC-06-003	Dismantling and recycling of ecodesigned helicopter demonstrators		200.000	
JTI-CS-SAGE	**Clean Sky - Sustainable and Green Engines**	**18**	**20.000.000**	**15.000.000**
JTI-CS-SAGE-01	*Area-01 - Geared Open Rotor*		1.000.000	
JTI-CS-2011-1-SAGE-01-001	Lean Burn Control System Verification Rig		1.000.000	
JTI-CS-SAGE-02	*Area-02 - Direct Drive Open Rotor*		4.500.000	
JTI-CS-2011-1-SAGE-02-006	Pitch Change Mechanism key technologies maturation		2.000.000	
JTI-CS-2011-1-SAGE-02-007	PCM kinematic demonstration		2.200.000	
JTI-CS-2011-1-SAGE-02-008	Propellers electrical de-icing system: reliability assessment of key technologies for high temperature electrical machines		300.000	
JTI-CS-SAGE-03	*Area-03 - Large 3-shaft turbofan*		6.900.000	
JTI-CS-2011-1-SAGE-03-007	Large 3-shaft Demonstrator – Core Turbomachinery – High Temperature Flexible PCB		600.000	
JTI-CS-2011-1-SAGE-03-009	Large 3-shaft Demonstrator – Aeroengine intake acoustic liner technology development		5.000.000	
JTI-CS-2011-1-SAGE-03-010	Steel casting process advancement		800.000	
JTI-CS-2011-1-SAGE-03-011	Advanced press forming and hardening of high strength steels		500.000	
JTI-CS-SAGE-04	*Area-04 - Geared Turbofan*		5.300.000	
JTI-CS-2011-1-SAGE-04-008	Casting process optimization and validation of hollow multivane clusters with thin walls and trailing edges		600.000	
JTI-CS-2011-1-SAGE-04-009	Integrating forging- and process-simulation into SAGE4 GTF LPT rotor design		400.000	
JTI-CS-2011-1-SAGE-04-010	Total Measurement System for Geometry and Surface Inspection of bladed Disks (TOMMI)		1.300.000	
JTI-CS-2011-1-SAGE-04-011	Implementation of Carbon-Nanotube Rein-forced Aluminum for Aerospace Heat Ex-changer Applications		1.000.000	
JTI-CS-2011-1-SAGE-04-012	Electric Smart Engine Actuator		1.000.000	
JTI-CS-2011-1-SAGE-04-013	High temperature Ni-based alloy forging process advancement		500.000	
JTI-CS-2011-1-SAGE-04-014	High temperature Ni-based super alloy casting process advancement		500.000	
JTI-CS-SAGE-05	*Area-05 - Turboshaft*		2.300.000	
JTI-CS-2011-1-SAGE-05-013	Feasibility study and prototypes manufacturing of oil tank in thermoplastic for Helicopter Engine		450.000	
JTI-CS-2011-1-SAGE-05-014	Hot environment unsteady pressure sensors		750.000	
JTI-CS-2011-1-SAGE-05-015	Development of Quiet exhaust noise attenuation technologies		1.100.000	
JTI-CS-SFWA	**Clean Sky - Smart Fixed Wing Aircraft**	**12**	**9.900.000**	**7.425.000**
JTI-CS-SFWA-01	*Area01 – Smart Wing Technology*		2.100.000	
JTI-CS-2011-01-SFWA-01-034	Analysis of sensitivity/robustness of distributed micron-sized roughness elements (MSR) for transition delay		500.000	
JTI-CS-2011-01-SFWA-01-035	Grooved paint surface manufacturing and aerodynamic testing		350.000	
JTI-CS-2011-01-SFWA-01-036	Automated riblet application on relevant aircraft parts		550.000	
JTI-CS-2011-01-SFWA-01-037	Basic wind tunnel investigation to explore the use of Active Flow Control technology for aerodynamic load control		250.000	
JTI-CS-2011-01-SFWA-01-038	High Voltage amplifier for MEMS-based Active Flow Control (AFC) actuators		450.000	
JTI-CS-SFWA-02	*Area02 – New Configuration*		3.150.000	
JTI-CS-2011-01-SFWA-02-012	Design and manufacturing of an innovative shield - A		70.000	
JTI-CS-2011-01-SFWA-02-013	Design and manufacturing of an innovative shield - B		90.000	
JTI-CS-2011-01-SFWA-02-014	Design and manufacturing of an innovative shield - C		90.000	
JTI-CS-2011-01-SFWA-02-015	Ground Based Structural and Systems Demonstrator Phase 3 – Component and sub-system manufacture		2.900.000	
JTI-CS-SFWA-03	*Area03 – Flight Demonstrators*		4.650.000	
JTI-CS-2011-1-SFWA-03-006	Outer wing assembly for tooling manufacturing		3.000.000	
JTI-CS-2011-1-SFWA-03-007	Low drag wing foam cover for flight test		900.000	
JTI-CS-2011-1-SFWA-03-008	Acoustic Inlet Lip panel large scale endurance demonstrator		750.000	
JTI-CS-SGO	**Clean Sky - Systems for Green Operations**	**5**	**1.700.000**	**1.275.000**
JTI-CS-SGO-01	*Area-01 - Definition of Aircraft Solutions and explotation strategies*			
JTI-CS-SGO-02	*Area-02 - Management of Aircraft Energy*		1.450.000	
JTI-CS-2011-1-SGO-02-014	Construction of evaluation Power Modules to a given design		250.000	
JTI-CS-2011-1-SGO-02-026	Modelica Model Library Development Part I		300.000	
JTI-CS-2011-1-SGO-02-032	Current return simulation (methodology & tool)		400.000	
JTI-CS-2011-1-SGO-02-033	Optimisation of coating for low pressure operation of power electronics and identification of pass and fail criteria for r		500.000	
JTI-CS-SGO-03	*Area-03 - Management of Trajectory and Mission*		250.000	
JTI-CS-2011-1-SGO-03-011	Flight operations for novel Continous Descent Operations		250.000	
JTI-CS-SGO-04	*Area-04 - Aircraft Demonstrators*			
JTI-CS-SGO-05	*Area-05 - Aircraft-level assessment and exploitation*			
JTI-CS-TEV	**Clean Sky - Technology Evaluator**	**0**		
		topics	VALUE	FUND
	totals (€)	**58**	**42.490.000**	**31.867.500**

Clean Sky - Systems for Green Operations

Identification	ITD - AREA - TOPIC	topics	VALUE	MAX FUND
JTI-CS-SGO	**Clean Sky - Systems for Green Operations**	**5**	**1.700.000**	**1.275.000**
JTI-CS-SGO-01	*Area-01 - Definition of Aircraft Solutions and explotation strategies*			
JTI-CS-SGO-02	*Area-02 - Management of Aircraft Energy*		**1.450.000**	
JTI-CS-2011-1-SGO-02-014	Construction of evaluation Power Modules to a given design		250.000	
JTI-CS-2011-1-SGO-02-026	Modelica Model Library Development Part I		300.000	
JTI-CS-2011-1-SGO-02-032	Current return simulation (methodology & tool)		400.000	
JTI-CS-2011-1-SGO-02-033	Optimisation of coating for low pressure operation of power electronics and identification of pass and fail criteria for		500.000	
JTI-CS-SGO-03	*Area-03 - Management of Trajectory and Mission*		**250.000**	
JTI-CS-2011-1-SGO-03-011	Flight operations for novel Continous Descent Operations		250.000	
JTI-CS-SGO-04	*Area-04 - Aircraft Demonstrators*			
JTI-CS-SGO-05	*Area-05 - Aircraft-level assessment and exploitation*			

Clean Sky Joint Undertaking
JTI-CS-2011-1-SGO-02-014

Topic description

CfP Nbr	Title		
JTI-CS-2011-1-SGO-02-014	Construction of evaluation Power Modules to a given design	End date	June 2013
		Start date	July 2011

1. Background

This activity within WP2.3.1 of SGO is concerned with the design, fabrication and evaluation of planar, or sandwich, module technologies for a high-temperature power electronics module. The work package consortium will deliver a liquid-cooled, 10 kW Silicon Carbide-based power converter with a 4-leg topology. A non-hermetic technology is anticipated with a nominal ambient temperature range of -60°C to +200°C. Planar/sandwich packages have no bond wires, can be cooled from both sides delivering improved thermal performance and can be optimised to give exceptionally low parasitic inductance. Although potentially attractive, the assembly of such structures has historically proved complex and costly, involving a large number of piece parts and assembly processes. Key targets of the work therefore include techniques to reduce the cost and complexity of both the substrate and assembly process. The consortium is seeking a partner who can contribute to our targets as detailed below.

2. Scope of work

1) Design study:

Prepare a fully justified mechanical and thermal design for the planar module assembly process.

2) Technologies for planar module substrate fabrication:

Establish rapid prototyping technologies to realise contact features and interconnect posts on DBC (Direct Bonded Copper) or AMB (Active Metal Brazed) substrates. The target minimum feature size is 0.3 mm x 0.3 mm with a height of at least 0.5 mm. Materials, co-planarity and compliance to suit the chosen assembly process based on design study 1) and in service requirements.

3) Cost-effective manufacturing route:

Establish a manufacturing process, employing diffusion soldering or sintering, to assemble planar modules using the substrates developed in 1) and a minimum of additional piece parts and processes. The maximum allowable assembly temperature is 300°C.

3. Type of work

1) Design study:

A mixture of thermal and mechanical simulation will be required to establish the feasibility of the proposed substrate and module assembly.

2) Technologies for sandwich substrate fabrication:

Investigate alternatives to substrate etch processes including (for example) electroplating and Direct Metal Laser Sintering (DMLS) to realise features for top contacts and interconnect posts. A significant challenge here will be maintenance of co-planarity of the layered assembly so controlled compliance is expected to be essential to ensure reproducible assembly.

2) Cost-effective manufacturing route:

Establish a low-temperature diffusion-soldering/sintering process, to achieve thin, well filled joints, with a carefully controlled bond-line thickness at bonding temperatures below 300°C. Develop a manufacturing process employing the developed bonding process that can be applied to assemble the planar module with the minimum of process operations and piece parts.

4. Special skills, certification or equipment expected from the applicant

The successful partner will have expertise and capability in rapid prototyping, electroforming and/or other additive processes applicable to the electronics industry. Experience in the application of thermal and mechanical co-design is essential as is knowledge of physics-of-failure-based reliability design. The partner will be skilled in the application of diffusion-soldering/sintering and encapsulation to power electronic devices and modules. The partner will include a power module manufacturer equipped and resourced to provide the type and number of modules required for programme evaluation. Finally, the partner will be able to demonstrate an established track record in working with industry and academia on power module technologies for aerospace applications.

5. Major deliverables and schedule

Deliverable	Title	Description (if applicable)	Due date
D1	Detailed substrate and process design	Fully justified design including mechanical, thermal and life models	October 2011
D2	Substrate technology delivered	Samples of substrates to agreed specification available	February 2012
D3	Assembly technology delivered	Samples of assembled planar modules available	May 2012
D4	Prototypes	Planar modules for 10 off converter assemblies delivered	March 2013

6. Topic value (€)

The **maximum value** for this topic is

250.000 €

[two hundred fifty thousand euro]

Please note any proposal above this value will be NOT be eligible.

7. Remarks

Clean Sky Joint Undertaking
JTI-CS-2011-1-SGO-02-026

Topic description

CfP Nbr	Title		
JTI-CS-2011-1-SGO-02-026	Modelica Model Library Development	End date	30.04.2013
		Start date	01.06.2011

8. Background

The Systems for Green Operations ITD of Clean Sky aims at demonstrating substantial environmental and economic benefits of more electric aircraft systems technologies. The design and validation of such highly integrated systems urge the need for more co-operative development processes involving aircraft, engine, and equipment manufacturers. The design process has to be supported through advanced modelling and simulation capabilities. Therefore the goal of the consortium is to define standardised modelling methods and tools in each phase of the energy system design process.

The Systems for Green Operations ITD is looking for several Modelica modelling specialists to become a partner of the consortium for implementation of the following Modelica libraries and models:

1. Modelica media models for often used media in aircrafts.

2. Modelica library for detailed converters, electrical machines and basic magnetic models as needed for aircraft electrical systems.

3. Modelica library for wavelets to improve power quality assessment in aircraft electrical systems.

9. Scope of work

1. Modelica media models for often used media in aircrafts

In Clean Sky SGO ITD, several members are working on modelling and simulation of thermal aircraft systems (such as environmental control systems, supplemental cooling systems, thermal management). These efforts rely on accurate representations of the thermodynamic properties of the involved fluids.

This call for proposal covers the implementation of thermodynamic property models for the refrigerant R134a and moist air. Both shall be implemented in the modelling language Modelica following the interface of the standard library Modelica.Media.

The refrigerant R134a shall be implemented according to Tillner-Roth and Baehr [1]. The implementation shall cover all elements defined in the interface Modelica.Media.Interfaces.PartialTwoPhaseMedium (and its super classes) and have the range of validity of the original reference.

A moist air model is already included in the Modelica Standard Library (Modelica.Media.Air.MoistAir). However, the range of operating conditions for the applications in aerospace is beyond the validity of this implementation. Therefore, the available implementation shall be expanded with respect to the temperature range of validity to -100°C to 250°C. Furthermore, all elements defined in the utilized interfaces but not in the implementation shall be added (such as the function *isentropicEnthalpy()*).

Both implementations have to be released for inclusion in the Modelica Standard Library under the Modelica License 2.0 (see http://www.modelica.org/licenses/ModelicaLicense2).

This is related to work contracted in the 2nd call (JTI-CS-2009-2-ECO-02-002) and shall be coordinated with the latter.

2. Modelica Library for Converters, Electrical Machines and Basic Magnetic Models

In more electric aircraft the Modelica.Magnetic library is of great interest for converters (e.g. transformers) and electrical machines (e.g. synchronous machine). The following components shall be developed, extending the Modelica.Magnetics library:

- General Hysteresis model for integration into FixedShape models leading to stable simulation even for complex models.
- Modelica functions to fit material data/measurements to hysteresis models.

- Modelica functions to fit material data/measurements to current magnetisation characteristic functions (i.e. relative permeability as a function of magnetic flux density).
- Hysteresis characteristics for common soft materials.
- A library for standard transformers containing:
  - General 1-phase and 3-phase transformer models (customizable).
  - Models for delta-delta, wye-wye, delta-wye and wye-delta 3 phase transformers.
  - Nonlinear material characteristics and hysteresis properties that are tuneable.
  - Internal model properties like electrical resistance of windings, magnetic reluctances and further shall be calculated within the transformer-models derived from basic geometric properties of the transformer (dimensions, number of turns, …).
  - Optional eddy current elements shall be integrated into the models (either provide extra models considering eddy current losses or conditional eddy current element).
  - The heat dissipated due to resistive, eddy current and hysteresis losses shall be provided via optional heat ports.
- Nonlinear demagnetisation curve for hard magnetic materials.
- Permanent magnet element.
- Lamination of material shall be considered in fixed shape elements and transformers (via stacking factor).
- Rotational elements containing:
  - Torque elements equal to force elements (air gap)
  - Basic electrical machines (e.g. synchronous machine) using:
    - magnetic library elements or
    - look-up tables

The developed models (especially the transformers) shall be validated against real measurements.

All improvements and extensions shall be documented for user friendly and intuitive utilization.

All implementations have to be released for inclusion in the Modelica Standard Library under the Modelica License 2.0 (see http://www.modelica.org/licenses/ModelicaLicense2).

3. Modelica Library for Wavelets:

The wavelet method offers significant features in capturing, identifying, and analyzing local, multiscale, and nonstationary processes. To exploit the powerful functionalities from wavelet methods such as analyzing, reconstructing, and modelling signals, a Modelica wavelet library is to be developed. The desired wavelet library shall contain the following key features:

- Standard wavelet families, including Daubechies wavelet filters, complex Morlet and Gaussian, real reverse biorthogonal, and discrete Meyer.
- Wavelet and signal processing utilities: analysis and synthesis.
- Interactive tools for continuous and discrete wavelet analysis.
- Customizable presentation and visualization of data.
- Wavelet packets.

The library should be implemented with reliable and efficient numerical algorithms.

The developed library has to be released for inclusion in the Modelica Standard Library under the Modelica License 2.0 (see http://www.modelica.org/licenses/ModelicaLicense2).

10. Type of work

1. Modelica media models for often used media in aircrafts

The selected partner has to lead the implementation, documentation and validation of the thermodynamic property models of the given fluids.

2. Modelica Library for Converters, Electrical Machines and Basic Magnetic Models

The task of the new partner is to design and implement a Modelica.Magnetic Library Extensions and validate the models against measurements.

3. Modelica Library for Wavelets

The task of the new partner is to design and implement a Modelica wavelet library for signal analysis and synthesis.

11. Special skills, certification or equipment expected from the applicant

A consortium of several partners is desired, where every partner has a specific and detailed know-how in the respective area needed for the library development.

1. Modelica media models for often used media in aircrafts

- Proven know-how of the object-oriented modelling language Modelica and the Modelica.Media library
- Proven know-how of thermodynamic property models, especially in the implementation of two-phase media models.

2. Modelica Library for Converters, Electrical Machines and Basic Magnetic Models

- Proven know-how of the object-oriented modelling language Modelica and the Modelica.Magnetic library
- Proven know-how of magnetic and electrical modelling
- Capable to validate models on in-house test rigs and proven know-now to perform such tests.

3. Modelica Library for Wavelets

Knowledge on the wavelet theory, reliable numerical methods and Modelica know-how are required. Experience in applying wavelet methods to modelling and analyzing power electronic systems are beneficial.

12. Major deliverables and schedule

Deliverable	Title	Description (if applicable)	Due date
D1	Preliminary version of Modelica media models	Modelica library	28.02.2012
D2	Documentation (including validation results) and final version of Modelica media models	Modelica library and Technical report	31.05.2012
D3	Preliminary version of Modelica.Magnetic library extension	Modelica library	30.11.2012
D4	Documentation (including validation results) and final version of Modelica.Magnetic library extension	Modelica library and Technical report	31.05.13
D5	Preliminary version of Modelica Wavelet library	Modelica library	28.02.2012
D6	Documentation (including verification results) and final version of Modelica Wavelet library	Modelica library and Technical report	31.05.2012

13. Topic value (€)

The total value of biddings for this work package shall not exceed :

300,000 €

[three hundred thousand euro]

Please note that VAT is not applicable in the frame of the CleanSky program and that any proposal above this value will be NOT be eligible.

14. Remarks

[1] Tillner-Roth, R., Baehr, H.D. An international standard equation of state for the thermodynamic properties of 1,1,1,2-tetrafluoroethane (HFC-134a) for temperatures from 170 K to 455 K at pressures up to 70 MPa. J. Phys. Chem. Ref. Data 26 (1994) 657-729.

- After 3 months of the start of the project, the planned concept for the respective library has to be presented and discussed with the respective CleanSky topic manager (proof-of-concept milestone).
- A consortium that applies only for the first two topics (media models, magnetic library) might be also accepted, provided there is not a consortium with comparable skills that applies for all three topics.
- The topic value under (6) is the upper bound for the total budget (so the sum of funding and contributor expenses).
- CleanSky “Founding members” as well as “Associate Partners” within “CleanSky – Systems for Green Operations” cannot apply for this call. This rule excludes the following organizations: Aeronamic, Agusta Westland, Aircelle, Airbus, Alenia, Cranfield University, Dassault Aviation, Diehl Aerospace, DLR, EADS, Eurocopter, Fraunhofer, Galileo Avionica, Hispano.Suiza, Labinal, Liebherr, Messier, NLR, Rolls-Royce, Saab, Safran, Techspace Aero, Technofan, Thales, TU Delft, University of Malta, University of Nottingham, Zodiac.

Topic description

CfP Nbr	Title		
JTI-CS-2011-1-SGO-02-032	Current return simulation (methodology and tools)	End date	31.12.2012
		Start date	01.07.2011

15. Background

Composite materials such as CFRP (Carbon Fiber Reinforced Plastic) used in the design of aircraft in place of traditional metallic structures and skin do not have the same electrical properties as metallic material.

So the design of these new aircrafts has to include a new electrical network to ensure a number of electrical functions such as current of return for equipments, protection against electrical hazards, potential reference for the systems, lightning protection, etc… This network has been named **ESN** (Electrical Structural Network) on the new A350 and **CRN** (Current Return Network) on the new B787.

Unlike traditional metallic aircrafts, the impedance of this network can not be considered as negligible. It participates to the voltage drop to be taken into account for the sizing of the power lines (supply and return lines) connected to the equipment terminals. These power lines are part of the **EWIS** (Electrical Wiring Interconnection System - The definition of EWIS is provided in EASA CS25 subpart H).

WP2.3.3 of SGO aims at optimizing the EWIS. Thus methods and tools simulating impedances of this new network are necessary to perform EWIS optimization.

16. Scope of work

The call for proposal aims at selecting a partner that will be in charge of the development of a methodology and tools to calculate impedance matrices of the electrical network used on composite aircraft for electrical current return function. This network will be called **ALEEN** (ALmost Equipotential Electrical Network) in the description.

The first step will consist in the development of a method to determine the equivalent impedance matrix of ALEEN from DC to 2 kHz and the way to extend the calculation to 100 kHz. The geometry and the material properties of ALEEN will be provided through a CAD tool.

The EWIS network will be taken into account to determine the non DC matrix. The EWIS network definition could be rough (space reservation only for example) or detailed (EWIS routes).PEEC (partial element equivalent circuit) coupled with the Fast Multipole Method is a method identified by the WP Leader to obtain the matrix. Measured impedance values of the ALEEN network could be additional input data. Validation of the method through a measurement on a mock up will be performed by the WP Leader.

The second step will consist in the development of a tool to create the impedance matrices usable in an electrical database providing the equivalent impedance for the EWIS interconnection points to ALEEN.

The third step will consist in the development of an interface (GUI) between these matrices and an electrical design database to provide the impedance between 2 interconnection points of the EWIS.

17. Type of work

The selected partner shall deliver a methodology and a software tool.

18. Special skills, certification or equipment expected from the applicant

Research institute specialized in the field of electrical engineering and SME experienced in electrical simulation software tool.

The partner should be able to upgrade and make the maintenance of the tools during the clean sky program. The industrialisation and the maintenance of the tools is not part of the CfP.

19. Major deliverables and schedule

Deliverable	Title	Description (if applicable)	Due date
D1	Preliminary Description method (description of the method and scalabitlity to an entire aircraft)		31.12.2011
D2	Tool including the user manual		30.06.2012
D3	ALEEN Matrixs of the test case (model of the mock up)		30.06.2012
D4	Interface between tool and WP leader electrical database		30.06.2012
D5	Validation test plan for the tool		30.06.2012
D6	Description and justification of the method's application scope		31.12.2012
D7	Validation test results		31.12.2012
D8	Tool update including user manual		31.12.2012

20. Topic value (€)

The **maximum value** for this topic is

400,000 €

[Four hundred thousand euro].

Please note any proposal above this value will be NOT be eligible.

21. Remarks

CAD tool will be CATIA. The Digital Mock Up contains 3D geometry of composite skin and airplane structure, ALEEN physical data, EWIS space reservation, localisation of the connectors and terminal equipments. It contains information about materials.

Electrical design database contains EWIS electrical data usable for the topic such as resistance and length of each cable, the routing of cables in the space reservation and the BOM of the wire harnesses. Exchange files with the interface to be created shall be in XML format.

Validation of the method: The WP Leader will design and make a simplified mock-up of an airplane section (size about 1/10) with representative impedance of the electrical network in term of composite skin, ALEEN network and EWIS Network (space reservation in a first step and then representative harnesses). This Mock-up will be design with CATIA and the electrical design tool of WP Leader as input data to use by partner to determine the equivalent impedance matrices.

A first level of validation will consist in a preliminary validation of the method, performed by the partner using simple test case and simulation with a validated software.

A second level of validation will be performed by test.

Measurements matrices, carried out by the WP leader per the validation test plan defined by the partner and approved by the WP leader (including acceptance criteria), will be compared with the computed results of the partner at DC and several frequencies.

Clean Sky Joint Undertaking
JTI-CS-2011-1-SGO-01-033

Topic description

CfP Nbr	Title		
JTI-CS-2011-1-SGO-02-033	Optimisation of coating for low pressure operation of power electronics and identification of pass and fail criteria for respective corona testing	End date	30.12.2013
		Start date	03.07.2011

22. Background

In the frame of Clean Sky SGO ITD, one of the project member is developing an electrically driven air system enabling both air conditioning and thermal loads management. A weight optimised power electronic is foreseen in order to drive the system. Weight saving is achieved by a so-called “open box” concept for light weight housing which imposes new challenges to the PE (Power Electronics) design with respect to coating. The power electronic has to be protected against the impact of low pressure and condensation water (dew).

23. Scope of work

This call for proposal aims to select a partner, who will be in charge of

- the choice of suitable coating for the PE and signal boards operated with low air pressure and at temperatures in compliance with RTCA DO 160 section 4 and section 5. The coating shall also withstand severe humidity conditions e.g category B of DO 160 issue F and shall be protected from erosion.
- the elaboration of processes for the application of the coating material during the assembly phase,
- the derivation and description of pass and fail criteria for corona testing and
- the choice of test equipment and the testing of corona itself.

As the Power Electronic itself is developed by SGO member, a close co-operation is required in order to identify the special requirements of the PE-modules, power bus bar, drivers, signal-boards and connectors including the assembly sequence.

24. Type of work

The Partner will be responsible for the coating concept and the validation. Test conditions have to be compliant with the environmental requirements of the respective aerospace mission profiles provided by SGO member. Coating material and corona pass / fail criteria have to be identified.

25. Special skills, certification or equipment expected from the applicant

University or SME having significant experience in:

- coating materials and processes
- corona testing

26. Major Deliverables and schedule

Deliverable	Title	Description (if applicable)	Due date
D1	Coating concept for PE	• Report	30.12.2011
D2	Coating processes / subassembly tests	• Report	30.06.2012
D3	Corona pass/fail criteria	• Report	30.09.2012
D4	Testing of one PE including the description of the test equipment	Report	30.12.2013

27. Topic value (€)

The **maximum value** for this topic is
500,000 €.
[five hundred thousand euro]

Please note any proposal above this value will be NOT be eligible.

28. Remarks

Only if applicable.

Topic description

CfP Nbr	Title		
JTI-CS-2011-1-SGO-03-011	Flight Operations for novel Continuous Descents Including assistance in preparation, execution and analysis of a flight simulator experiment.	End date Start date	31-03-2012 01-06-2011

29. Background

The Systems for Green Operations ITD (Integrated Technology Demonstrator) of Clean Sky aims to demonstrate substantial environmental and economic benefits of new on-board systems and functions. Apart from the so-called “More Electric Aircraft” (MAE) those improvements will come from improved “Management of Trajectories and Missions” (MTM).

For the latter a Flight Management System (FMS) guidance function is under development for Continuous Descent Operations (CDO), which is based on Time and Energy. The guidance logic takes multiple parameters into account within this novel FMS function: Multi Parameter Guidance with Time and Energy Managed Operations (MPG-TEMO).

The innovation of MPG-TEMO, certainly with respect to current CDO’s, is to allow idle-thrust descents when traffic density is high. Therefore MPG-TEMO will cater strict time constraints, thus bringing the environmental and economic benefits of CDO's to all-day operations.

This call for proposal is meant to develop such a new guidance function, jointly with flight crews in HMI prototyping sessions.. A flight simulator in the Netherlands will be used for those piloted validations.

30. Scope of work

The aim of this Call for Proposal is to select a partner who is able to bring the innovation of Continuous Descent Operations to the flight deck from the operator perspective. Together with the current FMS and HMI (EFIS) developers, the partner assists in preparations, conducting and analysing the simulator experiment, for validating MPG-TEMO. The goal of this co-operation is to improve the maturity of this function from Technology Readiness Level (TRL 3) to TRL 4.

The work can be clarified in more detail:

a) Advice on improvements of the MPG-TEMO functions from Flight Operations perspective. At the beginning of the work the results of a technical batch study will be available and demonstrations on a simulator mock-up can be provided. The technical batch study is to prove the maturity at TRL 3. Apart from Flight Operations, interaction (advising role) with our FMS and EFIS developers is foreseen.

b) Development of Flight Procedures for Continuous Descent Operations with MPG-TEMO. As MPG-TEMO is expected to be introduced from 2018 onward, other novel functions are expected to be in place as well. Herewith roles of the Air Traffic Controller and the flight crew will change. The Airborne Separation Assistance System (ASAS) Interval Management is one of the functions that MPG-TEMO will work with. Sequence and content of the check-lists are seen as part of this activity.

c) Definition and selection of scenarios for the simulator experiment. Critical situations for the MPG-TEMO functions from the Flight Operations point of view are of interest. On the other hand the scenarios must represent realistic situations for the flight crews participating in the experiment (referred to as subject pilots). Pilot questionnaires are to be delivered in relation to the scenarios.

d) Develop a Pilot Briefing Guide. With modern media an introduction guide will be developed that explains to the subject pilots, the background of MPG-TEMO, how to operate with it and all other relevant information to take part in the simulator experiment.

e) Recruitment of qualified flight crews. Select and schedule flight crews for the simulator experiment. All costs related to the participating flight crews must be included in the bid. The experiment will be set up for 10 crews, each crew participating for 2 days at the simulator. It is assumed that a partner's staff-member is present at the simulator on all experiment days. E.g. for additional explications to the flight crews and to collect all relevant data and notes required for the analysis.

f) Analysis. The participating subject pilots will file comments by questionnaires per simulated scenario flight as well as an overall questionnaire and through a debriefing. The partner will analyse all the comments to derive a general conclusion and the recommendations for improvements on the MPG-TEMO function. The partner is responsible for the Analysis from Flight Operations perspective in close co-operation with MPG-TEMO developers' team that will perform the Technical Analysis.

g) Project pilot technical and management activities. In addition to the above defined tasks, the project pilot will need to be involved in verification and validation activities and plan to include certain periods for this. Also, the minimum project management activities necessary to establish proper communication and project control will have to be carefully defined and included in the bid. Like minimum and maximum number of foreseen progress meetings, quarterly progress reports, number of expected travels, travel and hotel/accommodation costs, minimum and maximum number of on-site attendance days for experiment and potentially for concept dissemination days, etc.

31. Type of work

The type of work requested in this call for proposal is to develop new flight operations for 2018 and beyond, especially related to Continuous Descent Operations (CDO).

Additionally the type of work is to validate by means of a flight simulator experiment an innovative FMS guidance technique for CDO, called MPG-TEMO that is based on the management of time and energy simultaneously. Apart from the validation experiment also work is requested in the preparations of the experiment (scenarios, pilot briefing guide, questionnaires) as well as in the analysis of it, this all from the flight operations perspective.

32. Special skills, certification or equipment expected from the applicant

The candidate partner, which may be a consortium, must be able to deliver a project leader, a "project pilot" and flight crews.

- The "project leader" has a background in Flight Operations and in conducting Human (i.e. pilot) in the loop experiments and is the point of contact for the MPG-TEMO developers and responsible for the deliverables.
- The "project pilot" has a long experience in flying commercial aeroplanes, and may be retired from active flying.
- For the flight-crews taking part in the simulator experiment it is required that they are actively flying commercial aeroplanes. The experiment improves in statistical relevance when the participating flight crews have different experience in both, number of flight hours as well as in type of aircraft. Though the simulator will comply with an Airbus A320 type of aircraft, it is expected that the flight crews can familiarise themselves in about an hour as situations which require the specific type-rating will not occur in the simulator experiment.

33. Major deliverables and schedule

Deliverable	Title	Description (if applicable)	Due date
D1	Flight scenarios to validate MPG-TEMO in a simulator experiment.	Based on the batch study results and mock-up demonstrations	15-08-2011
D2	Pilot briefing guide to participate in the MPG-TEMO simulator experiment.	Includes Flight procedures	15-10-2011
D3	Flight Operations Analysis of the MPG-TEMO experiment.	A qualitative operational assessment	15-03-2012

34. Topic value (€)

The **maximum value** for this topic is

250,000 €

[Two hundred fifty thousand euro].

Please note any proposal above this value will be NOT eligible.

35. Remarks

The bid must include all travel costs to the Netherlands.

Clean Sky - Technology Evaluator

Identification	ITD - AREA - TOPIC	topics	VALUE	MAX FUND
JTI-CS-TEV	Clean Sky - Technology Evaluator	0		

No topics from Technology Evaluator are included in this call.

====== End of Topic Descriptions for SGO ======

Due to the large number of topics in this call and the inclusion of graphics in many topic descriptions, the topic descriptions for **SAGE, SFWA** and **SGO** have been moved into annexes of the Call Fiche. These annexes can be found in the additional documents section of the call web page. The main part of the Call Fiche contains the topic descriptions for **ECO, GRA** and **GRC.**