

A. APPLICANT'S DETAILS

1. Eligible and seeking support under:

(tick one box only)

Companies with turnover less than \$50m	Companies with turnover of \$50m or more
Core Start Grant <input checked="" type="checkbox"/>	Start Plus <input type="checkbox"/>
OR	OR
Core Start Grant with Premium <input type="checkbox"/>	Start Plus with Premium <input type="checkbox"/>

2. Provide the following applicant details:

Applicant's Name Tesla Technologies P/L	Project Contact (in Applicant Company) Mr. Chris Clare
Applicant's ABN 19 093 417 540	Position Project Officer
Date of Incorporation (if incorporated) 27 March 2000	Address for Correspondence PO Box 175 Lennox Head NSW 2478
Street Address "Fern Court" Dale St Burrawang NSW 2577	Telephone Number (02) 66874300
Telephone Number (02) 4886 4477	Fax Number (02) 66874500
ANZSIC Code and Sub Division (see Annex A) 10X 130	E-mail Clare@nor.com.au
	Research Code (see Annex B) 073

3. Applicant's Organisational Relationships

(a) List all related organisations in the company group and their country of incorporation

(b) Attach a schematic diagram which shows these relationships and the percentage of issued share capital carrying full voting rights

(c) if the applicant is a private company list the names of major shareholders and the percentage of issued capital held

Related Organisation	Country of Incorporation
[a] Tesla group Holdings Pty Ltd : -ABN 48092199052	Australia- Parent company
[b] See[a] above	

[c] Jeffrey Tanner-Jones - 20,000 shares
Stephen Robert Ribich - 20,000 shares
Elton John Stone - 4,445 shares

See attachment [2]: - Constitutions & attachment [12] Financial statements for both companies.

4. Financial Information

Forecasts should include project costs as planned and any sales revenue but exclude grant funds associated with this project as income

New Company-No previous revenue	Previous 3 years			Current year	Next year
	97/98	98/99	99/00	00/01	01/02
Licence revenue					
Domestic	nil	nil	nil	Nil	nil
Exports	nil	nil	nil	nil	nil
Other Income (excluding grant funds)					
Net profit before tax	nil	nil	nil	nil	nil
Net tangible assets (total assets less intangibles, less total liabilities)	nil	nil	nil	\$1	[\$500,000]
Working capital (current assets less current liabilities)	nil	nil	nil	Being provided by shareholder loans as required	
Paid-up capital	nil	nil	\$1		
Number of employees	nil	2	2	2 increasing to 7	10
Total R&D Costs				\$1,290,089	\$1,311,317

5. Combined Turnover

Give the turnover for the applicant and related bodies corporate as would be determined by the Corporations Law.

Name of Organisation:	Turnover in Previous Years of Income		
	96 / 97	97 / 98	98 / 99
Tesla Technologies P/L [New company-nil turnover]	nil	nil	nil
Combined Turnover	nil	nil	nil

Please attach the last 3 years financial statements for the applicant and consolidated accounts for related companies and budgeted cash flow for the term the grant is expected to cover. [See attachment [12]- P&I and Balance sheets for both Tesla Rechnologies P/L & Tesla Group Holdings P/L]

6. Company Objectives

Outline your organisation's objectives over the next few years. Indicate: (a) the current product mix; (b) how the product/service/system that is the subject of the application fits in with the current product mix; and (c) why you have chosen this path. (Attach a copy of the company's business plan if available.)

The objectives of the company over the next few years are to develop and commercialise the following new microwave technologies, which are listed in order of priority.

1. Zinc fuming with EMM Group [Restec P/L]: - Zinc fuming refers to the specific application of the microwave technology, which is the subject of this R&D application [see attachment [a]]. Its immediate commercial application will be the extraction of Zinc metal from the MIM slagheap. The zinc content of the slagheap is estimated at 13.8% and the lead content at 5%. Other extraction processes have not proven viable. The zinc-fuming project offers to yield a cash flow before any of the other processes and as such priority will be given to it. Once cashflow is established the other projects can be advanced. **Potential licence income to our company is to the order of A\$7-10m per annum for a 30 year period from the Mt Isa slagheap alone.** Other potential contracts are being negotiated by Restec in Australia, North America and elsewhere, where at least 23 additional slagheaps have been identified.

team.

Production: - The plant development supervisor, Desmond White has extensive background experience in production having operated at management levels of Mount Isa Mines for 28 years including 6 years as General Manager of one of Mount Isa Mines best performing subsidiaries, Copper Refineries P/L.

Innovation: - An outstanding team of innovators has been brought together. They are Jeff Tanner-Jones, Chief Technical Director, who is solely responsible for developing this technology. Stan Morrow, Commercial Development Supervisor who has a long and successful background in the development of microwave technology at the Lockheed Martin facility at Oak Ridge, USA. Hugo Huey who has a brilliant and extensive career in the development of microwave technology in the USA makes up the innovation team.

Human Resources: - The company is fortunate to have senior staff and directors with extensive senior corporate management experience, which includes human resource management skills. The Chairman of the Board, Elton Stone, the project director, the Plant Development Supervisor, Stephen Ribich and The Plant Development Supervisor each have extensive senior corporate management experience in the private sector. They are complemented by the Project Officer, Chris Clare with senior corporate and project management experience in both the private and public sectors. He has operated at the Senior Executive Service level of the Commonwealth Government for some ten years and also at the same levels in State and Local Government for a total of twelve years. In the private sector he was recently employed at senior management level by Sylvatech P/L.

Finance: - The Chartered Accountant and financial controller is Graham Smith. He will be responsible for establishing the necessary business and financial systems. He has extensive knowledge and skills in the operation of major business activities and compliance with necessary statutory and industry accounting standards. He will ensure that all financial and requisite business records are maintained in a proper and up to date manner and will not less than bi-monthly provide the board with an ongoing report. He will also prepare the necessary financial section of each report required for R&D purposes. The Project Officer, Chris Clare, will provide requisite R&D reports and administer the progress of the project.

Legal: -the company Chairman, Mr. Elton Stone has an extensive and successful background in the legal profession. Commencing in his career culminated as the principal of Stone and Partners one of the largest law firms in regional Australia. Mr. Stone brought the benefit of his legal expertise to his successful career in the development of business and financial institutions. Mr. Stone will be the legal advisor to the company and provide advice and guidance in this field.

[See Attachment: - [6] CV's &

Supporting material - [c] [Organisational chart]

8. Management Performance

Describe (a) how well the company has performed in recent years; and (b) what previous R&D projects have been commercialised by the company.

[a] New company. Tesla Technologies P/l was established in 2000 with the aim of further developing and marketing microwave technology relating primarily to the extraction of metals from metal ores, metal residues and other materials. The process will simplify and substantially reduce the time and cost involved in current methods of extraction which have in many instances not been changed for thousands of years.

The technology has been further developed by Tesla following research programs investigating microwave applications at the University of Wollongong over fifteen years.

Tesla has developed the technology firstly in relation to the extraction of common metals such as tin and zinc from untreated ore and secondly in relation to the extraction of refractory metals [titanium, zirconium, tantalum etc. the latter being a more specialised process. Tesla intends completing the development of refractory metals extraction following the successful completion of the current zinc fuming project.

The initial laboratory results obtained by Tesla have now been confirmed by the Royal Melbourne Institute of Technology and Lockheed Martin Energy Systems in Oak Ridge, Tennessee, USA.

[See attachment: - [7] Test reports from: -

1. RMIT,
2. Lockheed Martin, Oak Ridge] &
3. CSIRO – Contract test program.

Tesla is now ready to proceed with further and final bench testing at CSIRO Melbourne and the development of the test rig. A highly qualified technical and managerial team has been put together by Tesla to complete the R&D project. Licencing agreements are in place with Restec P/L, which has been commissioned by MIM to extract Zinc from its Mount Isa slagheap.

[see attachment [4]

[b] no previous R&D projects

9. Previous Assistance

List previous Government assistance received by the company for undertaking R&D projects in the last 5 years. For example, any competitive grants received, syndicated projects participated in & tax concession etc. and their current status ie ongoing, successfully commercialised, technical failure etc.

New company-no previous Government assistance.

B. THE PROJECT

10. Project Title

Provide a short project title for reference purposes, and for use by the IR&D Board for public disclosures if the project is approved for funding.

The extraction of metals from smelter slag using microwave technology.

11. Project Description

In one or two sentences, describe the project outcome. This description may be used by the IR&D Board for public disclosures if the project is approved for funding.

The development of an on site thermo-chemical process for the extraction of metals from ores, mineral concentrates, metal alloys and residues. The process will simplify and substantially reduce the time and cost involved in current methods of extraction. Economic outcomes of the project are saleable metals product.

12. Eligible Project Costs and Dates

Grant amounts, including the Premium component, may be used by the IR&D Board for public disclosures if the project is approved for funding.

Estimated Eligible Project Cost	Grant Being Sought Core Start (50%) or Start Plus (20%)	Premium component (if applicable)	Proposed Commencement Date	Expected Completion Date
\$2,601,407	\$1,300,703-50	\$	23 / 02/01	22 / 2 / 02

Total assistance sought

\$1,300,703-50

13. Project Outcome

In two paragraphs describe: (a) the new or improved product or service arising from the project, and (b) why the product/service will be innovative or superior from both a technical and market perspective.

[a] The new product will be a thermo-chemical process based on microwave technology for the extraction of metals from ores, mineral concentrates, metal alloys and residues.

[b] The outcomes will be delivered using processes, equipment, services and other resources that are less capital intensive, consume lower total energy and require reduced consumables relative to current state of art enterprises.

4. Prior Work

(a) Describe the current status of the project and any prior work (including market research, preliminary experiments, literature or patent searches) which is evidence that the project is soundly based. (b) Identify all of your patents and patent applications relevant to this project. (If available, copies of first page and the claims in each patent, and copies of international search reports should be attached as well as your response to these search reports.) (c) Where possible identify competing patents and patent applications and discuss the potential impact on the outcome of your project. (d) If relying on background IP for this project provide evidence that you have access to that IP to enable the project to be conducted and the project outcome commercialised.

Description of process.

The Tesla process as applied to the recovery of zinc from metallurgical slag by fuming. The implications of cost efficient, electromagnetically-stimulated metal recovery upon metallurgical waste remediation, fixation of biological toxins in such wastes, impact upon leaching and further pollution, and the increased scope of uses or other disposal of treated slag materials.

As it applies to the present proposed project, the recovery of saleable metals from zinc-bearing slag from MIM's Mount Isa lead blast furnace, the Tesla process will be configured to recover zinc by microwave-stimulated fuming of zinc as its oxide, ZnO [in the zincite phase] with the gravimetric, mineral processing separation of most of the 5% lead as metal globules. Preliminary experimental work has provided microwave-processed slag material whose analyses have yielded results of nil Zn in the treated slag remnant. Concurrently, analyses of the fume recovered yielded results of high purity zinc oxide[>99.7% ZnO]

Microwave stimulated reactions-particularly as they manifest in the non-equilibrium plasma environment of the Tesla Process are acknowledged for their "catalytic" ability to enable reactions to proceed which might otherwise not proceed and which do not proceed under energetically comparable "conventional" thermal stimulation. Experimental results over a wide suite of resource, industrial and laboratory minerals indicate that the Tesla process is highly appropriate for configuration into a range of reduction applications for extractive and process metallurgy. Years of experimental/development work by various microwave research groups using earlier generation microwave technology have established the efficacy of microwave driven zinc fuming from a range of industrial and metallurgical wastes. The new generation Tesla Process confirms earlier results and lifts process efficiency well into the realm of commercial reality.

Recovery of saleable metal commodities from otherwise intractable waste material products of industrial and metallurgical operations provides benefits on several fronts. Most obvious is the recoverable value of the recovered metal or other commodity. Such removal of metallic elements may render the treated material fit for safe disposal – even as exposed landfill (as with Zn in the MIM slag), it may remove an element or phase which prevents chemical fixation – or economically viable processes, such as the Tesla Process, are not only ideal prior-treatments for waste remediation operations, but they can return "waste" as "commodity" and re-define the economics of waste treatment/waste remediation operations.

Tesla's intention (and expectation) with the zinc fuming project is to cost efficiently remove and recover the zinc fractions in the MIM Zn-bearing lead slag as high value commodity (zinc oxide of commercial purity) leaving a granular treated slag product which may have further processing value (as a cement component) or which may be utilised as a clean loose fill or a clean fine aggregate in concrete. From indications in the work of earlier groups, and following promising results from the initial experimental work program by the Tesla group, this intention is likely to become reality.

Current -

1. A highly qualified technical team has been assembled drawing together the most qualified and experienced Microwave researchers around the globe. It includes the developer of the Technology, J.Tanner-Jones, S.Morrow from the Oak Ridge establishment in the U.S. and Hugo Huey the founder of Micramics who is internationally recognised as the world's leading researcher into microwave technology. [See C/V's – attachment [6].
2. An eminent managerial team has been assembled with its members having extensive experience

Coffee.[see line drawings – supplementary material [g]

- Experimental tests using the R&D test rig for outturn of metal products from a range of feedstocks, particularly ores, mineral concentrates, metals alloys and residues as already nominated; internationally recognised US specialists in design of thermochemical processor systems of large turndown ratios are being retained for their specialist skills and experience over a wide range of successful applications;
- Development of enhancements to flowsheets, to engineering designs of process equipment units and to support services for the need of commercial plants, whose construction and operation are outside the scope of this nominated project.

16. R&D Work

16.1 Major Activities

List the major activities of the project in the table below. These major activities should collectively cover the entire work of the project, and the total activity eligible expenditure should be equal to the total project eligible expenditure (as shown in section 33).

	Major Activity	Start Date	Finish Date	Activity Eligible Expenditure \$
1	Project management- conduct by Tesla of project	23/2/01	23/2/02	\$736,407-00
2	Contract additional bench work- Uni of Wollongong	23/2/01	22/2/02	\$100,000-00
3.1	Contract mini-pilot plant testwork-CSIRO, Clayton	23/3/01	22/7/01	\$90,000-00
3.2	Hire, relocation, adaption of Prof Tran's MW unit, RMIT into 2.1 above	23/2/01	22/7/01	\$30,000-00
4.1	Contract to Thomas & Coffey for Engineering, Procurement, Construction, Commissioning & Management [EPCMM] of ½ tonne per hour Test Rig	23-3-01	22-10-01	\$850-00-00
4.2	Purchase, deliver and adapt a US sourced MW unit & applicators to the test rig	23/3/01	22/5/01	\$430,000-00
5	Conduct by Tesla of experimental programs	23/3/01	22/2/02	\$240,000-00
6	Contract assays & mineralogical services to support 1-4	23/2/01	22/2/02	\$100,000-00
7	Contract independent engineer to undertake technical assessment of activities 1-5 above; independent engineer to issue "Completion Certificate" for successful conclusion of technical activities, to Tesla	23/9/01	22/2/02	\$125,000-00
Total				\$2,601,407-00

Note: - For Thomas & Coffey cost estimates see attachment [10]

16.2 Major Milestones

List the major milestones of the project in the table below. Each milestone should ordinarily correspond to the completion of a major activity, or a sequence of them, as listed in the previous table, and the total milestone eligible expenditure should be equal to the total project eligible expenditure (as shown in section 33).

	Major Milestone	Achievement Date	Milestone Eligible Expenditure \$
1	Approval by Tesla of final report from CSIRO on contract mini pilot plant tests	31 / 7 /01	\$1,839,010-00
2	Acceptance by Tesla of half tonne rig from engineering company	31 / 10 /01	\$559,787-00
3	Submission by Tesla of final report on results of experimental test programs	31/ 2 / 02	\$402,610-00
Total			\$2,801,407-00

17. Major Activities Description

Describe the work within each major activity with reference (where relevant) to:

- (a) specific technical objectives that are to result from the activity and the underlying strategy to achieve those objectives; and
 (b) the innovation and technical risks involved in each activity

Activity 16 [1] Conduct of Project

The scope of Tesla management of the project includes the following business functions:-

1. Finance, funds accounting control and regular interval reports superintendence
2. Superintendence of allocation of research and development resources to program requirements
3. Personal resources superintendence to the prescribed requirements of Federal, State & Local Government laws and regulations
4. Engineering, construction, maintenance and services superintendence of allocated contractors to the project
5. Procurement and supply superintendence of feedstocks, products, wastes, energy and reagents needs to support the project; superintendence of decommissioning of the site to prescribed requirements
6. Superintendence of the technical assessment and completion test activities of the independent engineer

By direction and control of the above functions Tesla forecasts its ability to successfully complete the project within the prescribed time and financial commitments.

The project will encompass activities [16.2] to [17.7]

Activity 16 [2] Benchscale Tests

Over a long period prior to initiation of this submission, J Tanner-Jones and support staff at the University of Wollongong undertook a considerable suite of Benchscale Tests. They delineated, within bounds, the variables applicable to MicroWave processing of metal-bearing ores and non-metallic industrial minerals, ore concentrates and wastes and sundry ad-hoc materials including lead blast furnace slag.

Throughout the Research and Development program, as defined in this submission, needs will arise from time to time for confirmatory or scout benchscale tests to complement the earlier tests, verify approaches and explore variations to such work in marginally changed conditions. An amount of \$ 100 000 is accordingly allocated.

These activities will occur throughout the duration of the Project, from February 2001 to February 2002.

[a] Definition of specific technical objectives will arise from the benchscale tests; they are, improved recovery and quality features of liberated metals. The prime strategy of activity [2] is ongoing confirmation of the thermochemical processes to liberate metals products and acceptable wastes.

[b] Innovation risk is minimal from MW sources due to the wide use of MW systems similar to those of domestic applications. Innovation risks exist in the ability of a fluidised bed system to integrate with the microwave field and associated plasma. Technical risks associated with the laboratory benchscale tests are minimal but are in the field of occupational health and safety to personnel due to their exposure to small concentrations of heavy metal compounds, but readily contained in fume cupboards or local exhaust systems.

Other innovation and technical risks will no doubt occur over the course of the testing program but cannot be anticipated at this stage.

Activity 16 [3.1] Undertake Contact Mini-Pilot Plant Testwork at CSIRO, Clayton.

See attachment 1 [b]-CSIRO Work program.

TGH has in place a Confidentiality Deed/Confidentiality Agreement with CSIRO – Minerals for MicroWave assessment of its Technology Development. A Program of Research Studies has been jointly designed. Base line studies are underway as a precursor to the design Program. Preliminary results are encouraging for one base-line study. CSIRO – minerals were chosen because of their expertise in the field of Fluidised Bed Technology. TGH inspection of the one base-line study confirms the Highly professional standing of CSIRO's personnel and support services resources.

Innovation and Technical Risk:-

The innovation and technical risk to be encountered in the mini-pilot plant tests at CSIRO are as for those elaborated on in 16 [5] below.

Activity 16 [3.2] Hire, relocate, adapt and incorporate RMIT M W Unit into 2.1), above.

Already preliminary tests have been undertaken by RMIT resources and in this instance they will work in alliance with CSIRO – Minerals.

Activity 16[4.1] Award Contract to Engineering Contractor (T&C).

See:- Attachment [10] – Thomas & Coffey

A Contract package is planned for award to an engineering contractor for Engineering, Procurement, Construction and possibly (services) Management of the ½ tonne Test Rig. Thomas and Coffey, Unanderra NSW has already provided a Notional Estimate of the Project (+/-30%). They are high on the option list for consideration.

Activity 16[4.2] Purchase and Deliver and Adapt to the Test Rig a US-Sourced M W Unit.

Tesla has in place agreements with US-based Consultants/Equipment suppliers of large MW units, which will be incorporated into the Test Rig.

Activity 16[5] Conduct by Tesla Management of all Experimental Programs.

See Attachment 1 [c].

Bases:-

1. A multitude of benchscale experiments was conducted by Tanner-Jones at Uni of Wollongong in applying MW power to granulated lead slag in both laboratory crucibles and also in nominal "fluidised bed" systems. These experiments reinforced his earlier findings on metals extraction including zinc from wastes of metal processing.
2. A base line set of mini-pilot scale experiments was conducted for TESLA at CSIRO-Minerals in their centre for Fluidisation. No MW power was available to apply in this experimental regime. Granulated lead slag was tested in an environment of temperatures ranging from 900-1000 degrees c, reductants of carbon char, gaseous carbon monoxide and gaseous nitrogen for dilution and for purging purposes. Initial results are encouraging for the base line study.

Special notes:-

- At the present time it is only possible to conjecture as to the avenues for experimentation that will prove most fruitful.
- The levels of risk associated with the envisaged R&D program can be forecast with low probability at the present status of the project.

Innovations:

Background;

Molten waste slag from lead smelting has been granulated in fresh or saltwater for nearly a century whereas waste steel, copper and nickel slags have been granulated, generally, for less than fifty years.

Since the 1920's, zinc and lead in granulated, lump dump and current-make molten lead slag have been recovered by processing in blast furnace-type furnaces with the slag bath superheated by carbon [pulverised coal or char] in pre-heated air injected into the bath under pressure. Zinc and lead in the slag are fumed from the bath. The emanating gases and fume are cooled, the zinc/lead fume is collected in filter bags and further processed to extract the metals.

Innovation [1]:

Fluidisation of granulated slag at temperatures below its melting point in a reducing environment including solid and gaseous reagents

Innovation [2] The application of high energy MW power at levels to contact/irradiate the fluidised bed consisting of granulated lead slag, solid and gaseous reagents.

Note:- Refer attachment 14- Comparative Processes. Examination of processes 1-8 indicates that only the TESLA process incorporates these two innovations.

Innovation and Technical Risks

Innovation [1], Fluidisation:

Background;

Innovation and technical risk associated with the Tesla project can only be determined with reasonable probability by testing with the ½ tonne test rig as proposed.

The risks associated with the "fluidisation" innovation can be discerned from recent experience of fluidised bed technology applications in plants and operations of the copper and zinc/lead industries and earlier observations of fluidised bed technology in the nickel industry.

The innovation and technical risks include:-

1. Repetitive de-fluidisation of the bed due to "sintering/slagging" phenomena without the ability to economically overcome the problem.

2. Inability of fluidisation for the nominated environment in experiments to date, namely benchtesting and "skirmish" CSIRO mini-pilot scale, to evolve separately zinc fume without contamination of other metallic and non-metallic species.
3. Inability of experimental tests to date to provide demonstrable evidence of other likely adverse consequences, that is the unexposed risks at this stage of the project cycle.

Innovation [2], high energy Microwaves.

Background:

It is reiterated that the innovation and technical risks associated with high energy MW can be determined only by testing with the ½ tonne test rig as proposed. Nomination of the technical risks is based on the experience of Tesla staff [Tanner-Jones] particularly 4 years experience alongside Prof. H K Worner at the Microwave Application Research Centre involving a wide range of R&D studies, 10 years benchscale studies in high energy MW applications and international monitoring of technical developments in high energy MW developments.

Innovation & technical risks include:-

1. Little predictable scale up performance has been determined between benchscale and plant levels for high energy, high performance pyrometallurgical MW applications. Contrast this situation with low energy MW applications as typified by the food processing industry in a regime of modest processing temperatures, nominally 300 degrees c.
2. Lack of knowledge & data on scale up for chemical process environments for metals and non-metallic species in high-energy MW regimes.
3. At this stage, knowledge and data are lacking for high energy/plasma regimes applicable to metallic and non-metallic species in "non-equilibrium" plasma processing that Tesla has in mind.

Activity 16[6] Acquire Contract Assay and Mineralogical Services to Support Activities 1) to 5), above.

These services are planned for delivery from Australia-wide locations as needed. The adjacent Illawarra region has many resources of these styles but where needed, interstate sources will be acquired.

Activity 16[7] Award Contract to Independent Engineer to undertake independent technical assessment of the project for Tesla.

Following conduct of the various activities as listed above, and particularly at conclusion of 4) and 5) a full technical assessment of outcomes is required to be undertaken by an independent engineer in order that Tesla may be satisfied that all requisite technical aspects have been satisfactorily and successfully completed. The independent engineer will sign off to this effect a "Completion Certificate" will be a necessary Final Document.

Innovation and technical risk-Tesla project: - The following issues exist as of very low percentage possibility as weaknesses and threats to the Tesla project. The issues are based on Des White's personal experiences in Fluidised Bed [FB] technology within the Zinc/lead industry and in earlier FB technology applied to the copper industry.

Weaknesses:-

- [1] inability of the Microwave systems to selectively differentiate between evolved metal and oxide species- zinc, lead, cadmium & mercury- in the dispersed medium of the FB reactor;
- [2] Repetitive de-fluidisation of the bed material occurs due to "sintering/slagging" phenomena without the ability to economically correct the problem.

Special note:-

At this stage of the project cycle there is no capability to forecast with sound knowledge the likely economic outcomes to the Tesla project.

Threats:-

- [1] Following completion of the activities 1-7 of the planned program, the economics and sensitivity analyses are significantly negative to allow no degrees of freedom/alternatives to shift the TESLA Project into a viable zone.

18. R&D Management

To compliment your answers to these questions, where applicable provide specific examples of R&D management experience (a) Explain how each of the significant areas of technical risk (mentioned in section 17) will be managed. (b) Describe how the R&D will be managed to facilitate a competitive quality outcome (eg. through the use of best practice or technologies such as concurrent engineering, or rapid prototyping). (c) Describe history of relationship with any contracting organisation(s).

Tanner-Jones, J. has had substantial involvement over the years in R&D project management. Specific R&D projects undertaken include: -

- Muswellbrook Energy and Minerals Ltd: Pyrometallurgical research programs e.g. Neodymium oxide; egreduction of chromite and magnetite ores;
- NERDCC funded project at Wollongong University; Third generation petrographic studies in coals carbonisation.
- Victorian Brown Coal Board at Uni. Of Wollongong; Carbonisation of Victorian brown coals.

[a] The management of technical risk detailed in 17 above. Nil technical risk exists. The OH&S hazards to personnel associated with MW units and heavy metals and the method of managing them have also been addressed in 17 above.

[b] The R&D activities will be managed to facilitate a competitive quality outcome through: -

- Use of industry best practice
- State of art technology activities at CSIRO, Australia, and with US microwave systems being applied in US Department of Defence and Energy will form segments of the management approaches to secure high quality outcomes at each stage of R&D
- Concurrent engineering
- Rapid prototyping
- The sponsor engineering company will be involved with the mini pilot plant tests conducted on the one half tonne test rig to curtail delays in the loop, R&D testwork and engineering design activities.

[c] Tesla has no prior relationship with any of the contracting organisations.

19. Technical Strength

Describe (a) the key technical capabilities and R&D track record of the key personnel proposed to be employed on the project; and (b) the availability of appropriate equipment, facilities and other support available to the project team.

J. Tanner-Jones. As a foundation member of the Microwave Applications Research Centre [MARC], he was part of a team which was to become world recognised for its innovative microwave developments in applications for extractive metallurgy and for other scientific and industrial processes. His research interests and involvement included coal carbonisation, ferrous and non-ferrous extractive pyrometallurgy, including the effects of type and quality of reductant materials. He was project leader for projects investigating novel reduction techniques for the reduction of minerals of high end-value metals, the processing and sintering of metal matrix composites and intermetallic/ceramic materials, and novel chemical and plasma synthesis routes for the production of new and novel materials.

He has researched microwave enhanced mineral beneficiation, extractive pyrometallurgy and materials processing for some ten years. This culminated in the development of conceptually new plasma pyrometallurgical systems and materials processing and synthesis systems.

The current project [zinc fuming] is the direct outcome of this research. [see C/V- attachment [6]]

Des White has an extensive background at senior levels of management in the mining industry encompassing some 40 years. Included in that work history were some seventeen years of senior management with Mount Isa Mines. For six years Mr. White headed up Copper Refineries P/I one of MIM's most successful subsidiaries.

M.S. Morrow: - Eight years experience as a process engineer and R&D technical investigator in

microwave materials processing led to management of several Oak Ridge, US, Department laboratories for high temperature microwave processing of materials and advanced ceramics. More than ten papers have been authored or co-authored. Ten patent applications were made and six patents granted in the area of microwave processing.

Specific experience includes the development, installation and operation of microwave applicators. Process and equipment development have led to the scale up of high temperature processing for various industrial applications from capacitors to ceramics. Microwave development has supported the processing of special nuclear materials used by the Oak Ridge plant. Processes used to prepare tungsten cylinders for Rockwell, Inc. space applications were also developed.

Mr. Morrow recently ceased employment at the Oak Ridge establishment to take up a lucrative invited consultancy offer at the Lockheed Martin, Los Alamos, facility. He is also retained as an invited consultant to the Lockheed Martin facility at Los Alamos.

He will be employed by Tesla for the duration of the project and will travel to Australia as required. [See C/V for patents granted and patent applications – attachment [6].

Hugo Huey: - Worked for many years for the US Government in the microwave division of the research centre at Oak Ridge until recently when he established his own consultancy business, Micramics Inc, located in the Silicon Valley.

Widely acknowledges as one of the world leaders in the microwave technology field.

He will act as project consultant and has already had direct contact with the CSIRO in connection with the design of the preliminary applicator.

Following the completion of the CSIRO tests he will be primarily responsible for the selection of the generator and design of the applicator for the test rig. He will travel to Australia as required. [See C/V – attachment [6]

[b] Facilities available to the project

Tesla has in place agreements with various institutions and consultant laboratories to comfortably meet the requirements of appropriate experimental space, support staff and facilities and analytical capabilities, both in-house and independent.

Until now, experimental work carried out independently by Tanner-Jones at Wollongong have been independently assessed from characterisation studies [light-optical microscopy [LOM] and X-ray diffraction [XRD] performed at the University of Wollongong plus independent, corroborative analyses sourced off campus [XRD Newcastle] and X-ray fluorescence [XRF] Port Kembla, from BHP Laboratories, plus neutron activation analyses [NAA] from Becquerel Laboratories at ANSTO.

Arrangements from this point are as follows: -

Three stages of experimental testing will be carried out at CSIRO Minerals, Clayton, Vic. By their team at the Centre for Fluidised Bed Technology to substantiate the utilisation of microwave systems with fluidised bed technology and to optimise the integration of these technologies for this project.

The research expertise and full experimental and analytical facilities of CSIRO's infrastructure will be available for our contracted work at Clayton. The centre for Fluidised Bed Technology has a range of existing fluid bed rigs with the capability of experimental variation and amendment supported by comprehensive systems control and monitoring capable of supporting sophisticated systems analyses, plus the support of comprehensive in-house chemical and physical analytical services available to support both experimental direction and client requirements.

Arrangements are currently being finalised with the University of Wollongong for "industrial park" type space in which to set up Tesla's ½ tonne per hour test rig, whose design and fabrication is currently being negotiated with a nationally recognised fabrication engineer, Thomas & Coffey. The University will provide EPA/OH&S compliant space at a commercial rate to Tesla for assemblage, commissioning and operation of the test rig.

System monitoring will be conducted "on site" whilst analytical and material characterisation support for the test rig output [reduction product ZnO and remnant slag] will be carried out at the University main campus utilising LOM, SEM/EDS, TEM/EDS, XRD and XRF. Independent corroborative analyses will be sought from BHP Laboratories [XRF, XRD] and Becquerel Laboratories [NAA] plus the University of NSW [SEM/EDS/WDS/XRD and on-line systems analysis of test rig] and CSIRO, Clayton, Vic. [wet chemical, XRF, XRD, atomic absorption spectroscopy].

20. Associated Work

Briefly describe any activities (such as standards and regulations compliance, patenting costs, etc) which are essential to the project and must be funded during the course of the project, but are not eligible for grant support.

1. Standards development in Australia and New Zealand for new microwave technology application. E.g. Health & Safety
2. Costs associated with patent development & protection In U.S and other countries.

C. PROJECT COMMERCIALISATION

21. Market Potential

(a) Identify the market, describe its characteristics including market segments, estimated size, potential growth and barriers to market. If available, provide results from any market analysis already performed (b) Give the estimated market share the project outcome is expected to achieve and the basis for this estimate. (Attach letters of support if available).

The market for Tesla's technology is extremely specialised, as the technology is targeted at the removal of zinc and other metals from mining slagheaps. Tesla's technology has been identified as being potentially by far the best for the treatment and extraction of zinc from the MIM and Pasminco slagheaps. Restec is currently signing up slag heaps throughout the world for treatment and extraction of zinc and other metals

[see Restec information memorandum for market information- attachment [5]

22. Competitive Advantage

Identify the main competitors, their competing products or services, relative prices and explain what differentiates your product from that of your competitors.

There are no competitors in the development or application of this microwave technology, which has been identified by Restec as being the most suitable for treating the MIM and Pasminco slagheaps. This project is underway specifically as it is the most suitable technology for the extraction of zinc from the Mount Isa slagheap. [See supporting material [b] and attachment [5]; - reports and letters from Restec P/L and MIM]. There are a number of alternative methods of slagheap treatment, none of which have the capability of the Tesla technology. The only alternative which Restec considers potentially viable is Dacer [dilute aqueous copper electrolytic recovery] technology which has been commercialised by Zeftec Ltd. In summarising Restec's conclusions regarding suitable technologies for treating the MIM and Pasminco slagheaps, Restec states "The potential of the Tesla technology should not be understated. Never before has a technology shown so much potential in its early stages". [See attachment [5] -Restec information memorandum].

3. Commercialisation Strategy

How will the product or service arising from the project be commercially exploited? Include (a) proposed manufacturing and licensing arrangements, (b) intellectual property protection strategy, (c) selling and distribution arrangements, (d) the ultimate pricing strategy and (e) how barriers to entry will be overcome or tackled.

[a] Agreement has been reached between Tesla Technologies P/L & Restec Pty Ltd by which Restec has been granted an exclusive worldwide licence to the zinc fuming technology. Tesla

Technologies P/L is the holder of a sub-licence from Tesla Group Holdings P/L. The use of this technology is restricted to the treatment of mining slagheaps.

The sub-licencing agreement includes royalty calculation formulae, royalty payment procedures, currency-A\$, record keeping, defaults, performance criteria, access to and use of technical improvements, supply of Tesla personnel, confidentiality conditions, patent infringement, dispute resolution and termination. [See attachment [4]]

[b] The Chairman of the Board will supervise the company's intellectual property strategy. Elton Stone. With many years experience in business and specifically legal protection of new enterprises.

[c] The technology is to be sub-licensed to Restec P/L. [see attachment [5] -sub licence deed and agreement].

24. Market/Commercial Returns

(*Begin the table with the year in which the project is to commence)

A	B	C	D	E	F	G
Financial Year	Research Expenditure	Commercialisation Expenditure	Domestic Sales	Export Sales	Other Income	Net Income
	\$	\$	\$	\$	\$	\$
00.../01... ..*	1,299,339	Nil-technology licenced to Restec	nil	nil	nil	G=(D+E-F)-(B+C) -1,299,339
01.../02...	1,207,567	"	"	"	"	-1,207,567
02.../03...		"	221,000	"	"	221,000
03.../04...		"	1,471,000	"	"	1,471,000
04.../05...		"	4,414,800	"	"	4,414,800
05.../06...		"	8,829,000	"	"	8,829,000
06.../07...		"	14,716,000	"	"	14,716,000
TOTAL	2,506,906	"	29,651,800	"	"	27,144,894

Please note:

- B Represents total expenditure (both eligible and ineligible) on the research project
- C Represents total expenditure to make the project end product ready for commercial exploitation, including recurring costs (such as production, distribution and marketing)
- D Represents the value of domestic sales arising from the project
- E Represents the value of export sales arising from the project
- F Represents the value of other income arising from project
- G Represents the total of the income columns less the total of the cost columns

25. Market Returns

(a) Explain the assumptions on which the above figures are based

(b) Explain how the costs of commercialisation will be met.

Based on terms of sub-licencing agreement with Restec. Calculated on the agreed minimum quantity of remedial material to be treated annually x estimated zinc content retrieval @ market price X estimated royalty return to Tesla. [See attachments [4] & [5] -Sub-licencing agreement & Restec information memorandum.]

26. National Benefits

If the project is successful what national benefits will result for Australia beyond those which can be commercially captured by your company, eg exports, import replacement, employment, technology diffusion, environmental benefits, etc?

The national benefits for Australia are substantial. They include: -

1. The export by licencing agreements of international cutting edge technology, immediately applicable to the extraction of metals from slag heaps around the world. As such this technology will generate major export earnings for Australia. In Australia itself, the development of this technology will allow for the economic treatment of mining slag heaps and the retrieval of export earning product in the form of minerals which previously could not be retrieved. In the case of the first slag heap to be treated at Mount Isa the estimated value of zinc retrieved over forty years is to the order of \$3,000m.
2. The creation of a wholly new industry with associated high level technical employment in Australia and for company trained technical operatives, internationally. It is the intention of Tesla to train graduates in the application of this technology. Substantial employment will also be generated in the treatment of the slagheaps in Australia, to the order of some hundreds of new jobs.
3. Technical diffusion is as for [1] & [2] above.
4. The project will enable a safe and relatively cheap treatment process not only for mineral slagheaps but also for hazardous waste materials.
5. The development of the Tesla technology is a major advance in the treatment of mining waste in an environmentally acceptable manner. Restec P/l has identified its technology as offering the best opportunity for addressing firstly Australia's and then worldwide environmental problems caused by a previous lack of suitable technology to treat the slagheaps. [See attachment [5] - Restec information memorandum]

D. PROJECT FUNDING

27. Need for R&D Start Funding

Give the reasons why your project would not proceed satisfactorily without a grant. Indicate what is likely to occur with the project if it is not supported by a grant.

The total cost of completing the research and developing the zinc fuming technology to commercialisation is estimated at \$2.8m. Whilst the company is able to meet 50% of the estimated costs by agreement with Restec P/L to which it is licencing the technology [see attachment (4)], it would not be able to meet the full cost and must therefore seek assistance to do so. If grant assistance were not forthcoming the company would need to seek investor capital which could well either delay the project substantially or result in substantial equity going off shore.

28. Salary Expenditure

A. R&D Salaries (only for employees directly working on project)

Employee Name and Title	Current full time annual salary	Period to be employed on project	% of time on project	Expenditure by Financial Year \$			
				00/01	01/02	/	/
Mr. S. Ribich-Project Director	\$80,000-00	19/2 / 01 to 18 /2/ 02	68%	22,222-50	31,111-50		
Mr. J. Tanner-Jones-Technical Director	\$80,000-00	19/2 /01 to 18 /2 /02	100%	33,333-33	46,666-67		
Mr. D.White- R&D Plant Development supervisor	\$80,000-00	19/ 2 /01 to 18/ 2 / 02	62.5%	30,000-00	25,000-00		
Mr.S.Morrow- Technical Supervisor	\$70,000-00	19 /4 / 01 to 18 / 9 / 02	50%	25,000-00	10,000-00		
Mr. C.Clare – Project Manager	\$72,000-00	19/2/01 to 18/2/02	33%	10,000-00	14,000-00		
Technical Officer	\$40,000-00	19/6/01 to 18/12/01	100%	3,333-00	16,667-00		
Technical Officer	\$40,000-00	19/6/01 to 18/12/01	100%	3,333-00	16,667-00		
Casual wages	\$26,866-00	19/2/01 to 18/2/02		11,110-83	15,555-17		
Total A: R&D Salaries				138,332-66	175,667-34		

B. On Costs and Overheads

	% of R&D Salaries in A	Expenditure by Financial Year \$			
		00/01	01/02	/	/
Salary On Costs	30%	41,499-80	52,700-20		
R&D Section Overhead (if applicable)	50%				
Administrative Overhead	30%	41,499-80	52,700-20		
Total B: On Costs and Overheads		82,999-60	105,400-40		

C. Total Salary-Related Expenditure

Total A + Total B	Expenditure by Financial Year \$			
	00/01	01/02	/	/
	221,332-26	281,067-74		

29. Contract Expenditure

Note where total contract expenditure is greater than 25% of the project total, explain the basis of the costings and the activities to which it relates. Where contractors are related to applicant indicate this with an * after company name.

Name of Contractor	Description of Work to be Contracted Out	Expenditure by Financial Year \$			
		00/01	01/02	/	/
Uni. of Wollongong	Contract bench tests	50,000	50,000		
CSIRO-Minerals processing centre	Contract mini pilot scale tests.	90,000-00			
RMIT-Prof. Tran	Generator	15,000-00	15,000-00		
Micramics-Hugo Huey	Contract microwave research advice	50,000-00	20,000-00		
Consulting engineers, scientists	Contract engineering & scientific advice	32,000-00	16,000-00		
Contract assayists & mineralogists	Conduct ongoing assay & mineralogical testing	50,000-00	50,000-00		
Various:- Electricity Natural gas Nitrogen Char Supply & transport Disposal Transport Disposal of material Supply of baghouse bags & filters Replacement of bags/filters Engineering services Engineering services	Contract costs incurred by Tesla in experimental test programs Microwave-excess electricity Fluidisation chamber Reagent gases mix, cycle, carbon for reagent gases mix Reductant & bed material Test material ex Mt. Isa Test rig bed discharge Placement casts & fees Purchase & installation of initial bags/filters 2 sets Purchase/repair of replacement electric motors, blowers, conveyor belts Decommissioning, decontamination etc		50,000-00 20,000-00 25,000-00 15,000-00 20,000-00 10,000-00 10,000-00 20,000-00 40,000-00 35,000-00 15,000-00 240,000-00		
Independent Engineer	Technical assessment & sign off on project for Tesla		125,000		
Thomas & Coffey	Flowsheet development, engineering design, procurement & construction of half tonne test rig	250,000-00	400,000-00		
Total Contract Expenditure		537,000-00	936,000		

CSIRO costs relate to a series of contract mini pilot scale tests of fluidised bed testing of feedstock lead slag.

RMIT – Prof. Tran relates to hire of a suitable generator to enable contract mini pilot plant tests

ey Huey: -Retention of the world's leading authority on MW technology

Thomas & Coffey - reputable contractual engineers

R&D & engineering contingency: - to allow for unanticipated contingencies particularly in the engineering field

30. Plant Expenditure

A. Plant Not Constructed by Applicant

Description of plant	Purchased, hired or leased?	Taxation rate of depreciation or monthly hire/lease charge	Date Acquired	Purchase Cost \$	Residual Value (at project end date)** \$	Net cost in year of purchase/Hire/Lease Expenditure by Financial Year \$ X-Y
Uni. of Wollongong- Test Facilities	Leased		1/2/01- 21/2/02	X 15,000-00	Y N/A	0/01 6,250 01/02 8,750
Microwave & applicators-sourced from the US	purchased		March- May 01	430,000-00	nil	430,000-00
Sub-total A				436,250-00		8,750

B. Plant Constructed by Applicant N/A

C. Total Net Plant Expenditure

Expenditure by Financial Year \$	
00/01	
436,250-00	
01/02	8,750-00
Sub-total A + Sub-total B	

* State basis for calculation of residual value

** A set rate of 30% of wages for oncosts, a set rate of 30% of wages for Admin overhead and 50% of wages for factory overhead may b

32. Other Expenditure

Expenditure Item	Expenditure by Financial Year \$			
	00/01	01/02	/	/
Annual audit certificate fees	nil	3,000-00		
Domestic & overseas travel	48,250-00	44,500-00		
Technical information [e.g. Patent searches etc]	27,257-00	30,000-00		
Seminars & conferences -inc. overseas	8,000-00	8,000-00		
Overseas testing	12,000-00			
Total Other Expenditure	95,507-00	85,500-00		

33. Summary of Project Eligible Expenditure

Head of Expenditure	Expenditure by Financial Year \$				Total \$
	00/01	01/02	/	/	
R&D Labour Expenditure (section 28)	221,332-26	281,067-74			502,400-00
Contract Expenditure (section 29)	537,000-00	936,000-00			1,473,000-00
Patent Expenditure (section 30)	436,250-00	8,750-00			445,000-00
Prototype Expenditure (section 31)					
Other Expenditure (section 32)	95,507-00	85,500-00			181,007-00
Project Eligible Expenditure	1,290,089-26	1,311,317-74			2,601,407

34. Summary of Project Ineligible Expenditure (refer to section 20)

(patent costs, quality assurance, purchase of core technology)

Item of Ineligible Expenditure	Expenditure by Financial Year \$				Total \$
	/	/	/	/	
nil					
Project Ineligible Expenditure					

Total Project Expenditure

Head of Expenditure	Expenditure by Financial Year \$				Total \$
	00/01	01/02	/	/	
Eligible Expenditure	1,290,089-26	1,311,317-74			2,601,407
Ineligible Expenditure	0	0			0
Total Project Expenditure	1,290,089-26	1,311,317-74			2,601,407

36. Funding of Total Project Expenditure

Give in the table below the amount for each source of funding for the project

Funding Source	Amount \$
Internal funding (eg company cash flow)	
External funding (eg injection of equity, loans)	1,300,703.50
R&D Start funding	1,300,703.50
Total Project Costs	2,601,407-00

Provide details on each source of internal and external funding. Explanation of internal funding should include references to the company's financial statements indicating sufficient future profits and cash flow to support funding through operations. Explanation of external funding should include references to the source and nature of any security to be offered.

External funding is by way of limited recourse loans, from Restec P/L, which has a licencing agreement from Tesla for the use of the technology. [See sub licence agreement [attachment [4], sec 7].

The agreement with Restec provides that such company provide one half of the total cost of the works described in the agreement whether such works are covered by R&D or not. The amount required is estimated at \$1,450,000 in the details set out in annexure [a] to the agreement. However as the works are to be spread over almost a year Restec does not want to pay the monies in advance but only when they are required and the agreement provides for monthly payments in advance. Even though the amount is payable monthly there is a binding commitment to pay the whole amount over the relevant period.

It will be noted that the agreement between Tesla and Restec provides that either party may withdraw from the agreement should it become apparent that that the overall cost of the work exceeds by 20%, the amount set out in Annexure [a] attached to the agreement. It cannot be expected that Restec would enter into an open-ended agreement to provide one half of the costs regardless of how far those costs blow out. The 20% buffer was agreed to as a reasonable figure. The cost estimates have been prepared on the high side and Tesla is therefore confident that there will be an adequate, inbuilt buffer before any reliance on the 20% should take effect.

As the R&D work is basically the only work that will be undertaken by Tesla in the foreseeable future there will be little other expenditure of any substance that will be incurred during the period of the project.

The directors will cover any such additional expenditure in the same manner as outgoings incurred by the company up to the date of lodgment of the final application have been met. These costs should not exceed \$30,000 for the relevant period.

37. Repayment Of Start Premium - N/A

38. E. GENERAL

38. Referees

You may wish to include reports from suitably qualified referees who are able to comment on the strengths of your project and the ability of your company to carry out the project. (Referee reports are not an essential requirement of the application.)

39. Attachments

The following documents against the marked check boxes are attached to this application:

- Supporting Material (if required)
- Financial statements for the previous 3 financial years, including consolidated statements where the applicant is part of a group, and budgeted cash flow for the term the grant is expected to cover
- Schematic diagram of organisational relationships
- Company business plan
- Patents/patent search reports
- Project plan
- Letters of support
- Referees reports

40. Certification

I certify that:

- a) I understand and accept that, if the application is approved for funding, the project title, project description, the total cost, total eligible expenditure and grant support offered may be published by ISR in material for the promotion of its programs or in the Annual Report of the Industry Research and Development Board;
- b) I have read, understood and accept the General Conditions for the *R&D Start Program*;
- c) I have read and understood the eligibility criteria for an application in the Customer Information booklet, and to the best of my knowledge this application is eligible under those criteria; and
- d) the information provided in this application, including attachments, is true and correct to the best of my knowledge.

Name

Christopher Lawrence Clare

Position

Project officer

Date

23 / 2 / 01

Signature and Company Name



Tesla Technologies Pty Ltd

Please provide an estimate of the time taken to complete this application for assistance -
Include

- The time spent in actually obtaining the information, and completing the application;
- The time spent by all employees /consultants in collecting and providing this information

70

Days (work days)

Hours

Minutes