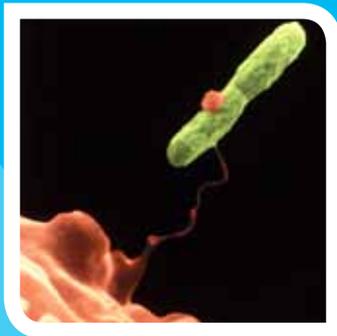


Engineers Ireland Presidential Address 2011
Building a Sustainable Recovery

14th September 2011



PJ Rudden
Chartered Engineer, FIEI

1. INTRODUCTION



I am honoured and indeed humbled tonight as your President to stand here where many great Presidents stood before me - some when the country was in the rising tide of prosperity but many too in times of recession. While we love our country dearly

and want to see it prosper, our greatest richness as engineers even in difficult times is what we can do to make it a better place to live, to support families, to learn to work, to rest and play and to grow old in comfort.

Tonight I want to explore with you how we engineers can make Ireland a better place not just in terms of infrastructure but in terms of resource efficiency, competitiveness and job creation. We want to work towards economic recovery but it has to be sustainable in environmental and social terms too.

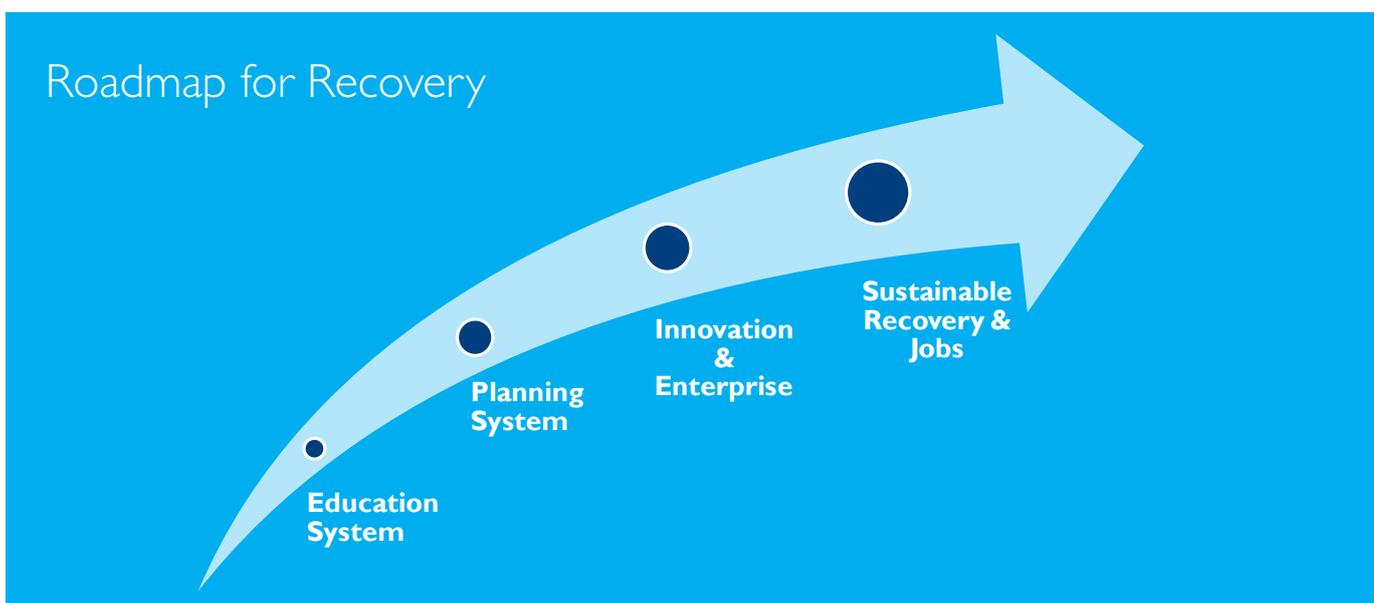
We are getting better as a nation in fast tracking badly needed infrastructure projects. In this regard I would instance the completion by the NRA of the interurban and M50 motorway system on time and within budget – a tangible and positive legacy of the boom. We can however do even better with more 'joined up' reform in our planning system. We need to strike a balance between the 'public interest' and the valid objections that many projects have to entertain. That will only come with political leadership mandated on the strength

of sustainable policies adequately informed in planning engineering environmental and in public communications terms.

We also need to ensure that we can inspire, nurture and grow the next generation of engineers who will meet even bigger challenges with the next generation of infrastructure and who too will have to manage the 'great forces of nature for the benefit of us all'.



I want to focus too on our educational system at primary, secondary, third and indeed fourth level to ensure that we are preparing our young engineers for work and early graduate experience as our education system in Ireland has always been the key driver of our competitive advantage. We also need to provide an adequate system encouraging 'life long learning' to the professional community to meet the growing demands of a dynamic economy where the 'shelf life' of many of our skills are constantly challenged. That flexibility should in future help us to retrain and move sectors in the event of even temporary downturn of other areas. We can draw our



Roadmap for Recovery starting with reforms in our education system, seeking reforms in our planning system that in turn lead to innovation and enterprise and in time to sustainable recovery and jobs.

The overall objective tonight is to outline the challenges I feel need to be tackled if we are to build a sustainable recovery and a solid future for our people. That means looking beyond the immediate crisis that we face as a country and start building a long term vibrant economy that will last into the future.

2. ECONOMIC PLANNING

The financial crisis over recent years has prevented long term economic planning happening to any serious degree. We are currently working through the 4-year National Recovery Plan 2010-2014 published by the last Government in autumn 2010 and accepted by the current Government, the EU and the IMF. While this was a necessary response to the unfortunate fiscal and banking crisis it does not help us with the required strategic longer term planning of the nation's infrastructure. Now is the time for long term economic planning like we had in the early 1960s. We seem to forget that the economists and engineers responsible for that era of planning are now the 'sung heroes' of today (Dr: TK Whitaker and his contemporaries).

But our world is very different now. In Ireland we have one of the most open economies and thus are buffeted constantly by international events.

At the same time I sometimes wonder if the quality of economic planning 50 years ago were to have been continued into the 70s, 80s and 90s would we now have the many problems we currently have - all of which have not been created by the banking crisis. I refer to unsustainable development and some systemic failures in our educational system for instance and to which I will return later in the address.

The reason why I took the dual challenges of education and planning as my principal themes tonight is we now have a new opportunity to educate our young and plan better for their future. As much of our economy is now broken and does need fixing, we now have a rare opportunity. That opportunity is to make radical changes in how we regulate our economy and our environment so that we can maximise resource efficiency towards maximum growth and job opportunity. There's an old saying that you can't beat a good crisis to effect real change when necessary. Much is currently being done by Government in terms of fiscal stability and regulation but what about the built environment that we engineers help to create and care for?

No more than in the banking and financial arenas it's never again going to be the same again. It's not going to be 'business as usual' either in the planning, engineering and environmental sectors, nor can it possibly be! I will return to the current challenges to planning and development later in my talk.



NUI Galway Engineering Building
(Image courtesy of NUIG)

3. THE SEEDS OF ENTERPRISE

So what can we do as a profession to assist economic development, recovery and job creation? When I last spoke to you some three months ago in my Inaugural Address I asked you to judge us not by what we say but by what we do. Our central theme this year in Engineers Ireland is job creation to help rebuild the nation by the creation of new enterprise in the productive, manufacturing and creative areas of the Irish economy. Nor can we forget the challenges of rebuilding our national infrastructure to also help drive that recovery.

So tonight I ask:

- What have we done in Engineers Ireland in the past three months?
- What more can we do in the next nine months and beyond in pursuit of these goals?

In the past three months we have advanced important decisions within Engineers Ireland – some of these were difficult decisions but all were designed to give strength to the engineering profession to make us more relevant to Irish society and to be a stronger driver of new enterprise.

- 1) We confirmed the raising of our standards for Chartered Engineer to a 5-Year Masters or equivalent after 2013 graduation.
- 2) We made further progress on the admittance of Bachelor Degree level 7 and also level 7 and level 8 'cognate' professions to full membership by working towards fully documented Routes to Titles for these members.
- 3) We have put plans in train to raise the profile of Chartered Engineer nationally through a new public communications campaign.

Our relevance though to society is best illustrated in not what we say but in what we do.

- Firstly, in the past few months we have profiled the continued importance of infrastructure in terms of transport, water, energy, waste and communications through our Infrastructure Report and through President's site visits and official openings to show examples of productive economic infrastructure around the regions and to highlight the benefits of balanced regional development.

- Secondly, we have sought to highlight the enterprise and job creation possibilities in our third level colleges and research institutes in renewable energy, nanotechnology, biomedical engineering and information technology. These research areas strongly support and nurture the current growth areas of the economy namely ICT, Biomedical, Energy and Pharmaceutical Engineering

In terms of profiling these examples I have in recent weeks visited the Digital Hub in Dublin, the STEM Conference in Cork, the Mizen Head Bridge in West Cork, the new NUIG School of Engineering in Galway, the Ryan and Digital Institutes in Galway, the Biomedical School in NUIG, the National Centre for Pharma Science and Technology in DCU, Phase I of the new Science Centre in UCD and the Marine Institute in Galway.

I've been to the Cork region twice, to the West region twice, to the North East region once and once to the Middle East region - meeting the regional chairpersons of Engineers Ireland in all cases. I plan to continue with these visits to other parts of the country with the support of the regions to the Tyndall Institute in Cork; the Corrib project in Mayo, the new Aran Islands Harbour at Kiltonan, the SEAI Wave Research Centre off Belmullet, and other projects and institutes of national importance.

I want the engineers and scientists who work there to know how much we value the part that they are playing in enterprise and innovation towards national recovery. The Director General and I spent the full day in Galway on September 7th last and I can tell you that on the way home I think we both clearly recognised the interest and support for these visits to the third and fourth level colleges and institutes.

While we need to encourage current engineering endeavour we also need to ask ourselves what seed corns can we lay in our education system starting at primary level, what green shoots can we fertilise to produce the future crops of enterprise?



UCD Science Centre
(Image courtesy of UCD)

4. ENGINEERING SKILLS

The degree in which we can contribute to a new frontier of enterprise and innovation is informed by a supporting role in a radical reform of the Irish education system starting in primary school. Some of this is currently underway at second level but more needs to be done. We need to educate to think not to learn by heart. We need to educate to understand not apply mere theorems or formulae. We need to educate to invent and to innovate not to copy, replicate or play it safe. We need to learn the skill not only to influence but to inspire and lead. We need to learn to communicate with the public. These creative skills don't come easy to the generations of engineers and scientists brought up on a diet of 'rote learning', formulae and theorems.

Of course engineers can be leaders of projects and enterprise but as I said last May we can only do so if we broaden our horizon and our interest beyond the pure engineering into the cognate professional areas. Look at the truly great engineers in history – few were sole proponents of engineering in fact.

If you Google 'great engineers' you will find Archimedes, Leonardo da Vinci, Stephenston, Brunel, Alexander Bell - when I say great engineers I mean people who actually built or created things - sometimes tools of battle but more often tools of peace like bridges, aquaducts, engines, machines, and communications systems leading to modern now virtual means of 'connecting people and places'.

Archimedes was a great mathematician, he was also a great engineer and scientist. Da Vinci was mostly known for his paintings and sculptures but also as engineer he built the machines that led to the current robots used in Biomedical Engineering. Brunel was principally a bridge engineer but he led and designed many other projects including railways, tunnels and aqueducts. He was also a tremendous communications scientist. He went into select committees of the British Parliament and proposed great schemes and defended them before the parliamentarians. Not an easy thing to do but unless we show ourselves of equal skill and vigour, we will not be able to build the necessary future infrastructure that Ireland needs to support future development. We will not be able to build the future sensitive projects like motorways, light rail, sewerage treatment plants, gas pipelines, overhead power lines, incineration plants or interregional water supplies from new sources.

All of the great engineers had a very broad grounding in skills that went well beyond planning, engineering, environment or communications. Looking back at their achievements, none would not dare ask did they have level 7, 8 or 9 qualification

or what college they went to? Indeed, were they what we now term 'engineers' at all or were they scientists or even artisans of some kind? But they were confident in their mission, they were rational in their thinking and evidence based in what they said and did. These were visionaries who looked to marshal all the great forces in nature for the use and benefit of man. They harnessed the great resources of nature in the air, on land and in the oceans. They used the power of the basic elements of nature – air, wind, fire and water to create new energy, new resources and new enterprise.

So if we are to create enterprise we cannot ignore the social, environmental, political or communications challenges in finding new energy resources, new water resources and new resources from waste. As engineers, we need to integrate with the planners, the environmental scientists, the social and political scientists, the economists and the communications specialists to create the holistic 'conversation' that can convince people to maximise the benefit of infrastructure and enterprise in the economy. In terms of job creation we also need to educate for current and future markets. These are markedly different than the markets of the past. We also need a broader attitude if not a broader education to the challenges of future engineering.

5. MATHEMATICS TEACHING AND LEARNING

Let me turn now to the area of education in general as there is much in common with engineering education particularly in the area of mathematics and science learning and teaching. At this stage I want to sincerely welcome the statement last night from Minister Sean Sherlock of the renewed government commitment to address the maths issue. Last year as your Vice President I chaired the Engineers Ireland Task Force Report on Maths and Science at Second Level, which was generally well received by the Minister, ASTI, parents and teachers as supportive of the changes required at Second Level.

Many of the findings surprised me not least the limited qualification of maths teachers and there are many reasons for this. We examined the new Project Maths curriculum and saw there the welcome seeds of change. The ambition is to move away from 'rote learning' towards 'learning through understanding'. We very much support the new maths approach but realise that it will take perhaps a decade or more to embed the new learning processes.

We recognise that the principal difficulty appears to be at junior cycle level, mostly due to unqualified teachers assigned to that cycle rather than senior cycle where generally the

more qualified teachers are employed. Indeed in this subject I really want to complement the NCCA – the National Council for Curriculum and Assessment for their open and creative approach to educational reform. I'm convinced that if they had been mandated earlier to examine curriculum reform we may not have the problems we currently have with maths teaching and learning. Recently Ministers of Education too have been very supportive of change not least the current Minister who has inherited the issue.



The most worrying feature now in my view is not only the challenge facing students who can be quite adaptable, but the difficulties confronting teachers in the system. Many of these lack the basic IT skills to even learn the new systems. Up to recently our educational system allowed some of them to teach maths with little technical qualification other than standard teaching skills. This can only lead to low interest and little passion for a difficult subject. Indeed the more I've learned of the unfolding situation in second level schools over the intervening two years since our Report the more concerned I am.

I want to say this very clearly to you tonight. It is not the teachers' fault that so many of them are unqualified, it is the fault of the system. I will not repeat the metrics here as nobody knows for sure how many unqualified maths teachers there are - not even the Department of Education and Skills. It must be said though that this situation will not reoccur since the setting up of the Teaching Council requiring teacher registration since 2006. There are many historical reasons for what happened arising from the management and patronage of schools, the protocols for principals and the lack of an adequate teacher registration system at national level. The current maths situation in Ireland is a systemic failure in the educational system at national level.

That failure now recognised will probably take at least a generation to rectify and that's assuming that the new Project Maths will in fact deliver which I'm presuming it will. Contrast this with a high performing country in maths like in Finland where the Programme for International Student Assessment (PISA) ratings are high but where you cannot teach the subject without a 5-year Masters in Mathematics and Education. In fairness some of our third level colleges recognised this some years ago and now have level 8 and level 9 courses in both of these subjects. For the most part though, because they are full time courses they are of limited value to existing teachers but of great value to incoming teachers.

The student must always be at the centre of the educational system but the quality of an educational system can never exceed the quality of its teachers. In passing I would comment that Engineers Ireland have engaged over the past year with the Teaching Council to get engineers registered for teaching of maths at second level, even as a temporary expedient to relieve the current situation. We have however had to agree that even engineers will require some upskilling in maths and education before taking on a teaching role.

We also noted in studying the primary and second level educational systems that there was no 'jointed up thinking' between the two - in fact there is still no current assessment or report card at the end of primary and no mechanisms for respective teachers or schools to meet at the interface. There is therefore a loss of intelligence information on pupils entering second level which takes many months to recover in their new schools. This is certainly not resource efficient and a poor quality management system not serving the student interest.

It is acknowledged that over the past year the entire junior level cycle is now under radical reform under a new theme 'Innovation and Identity' and the transition between primary and secondary is now being addressed also, partly I believe resulting from our 2010 Report.

Why does all this interest Engineers Ireland? Because the proper learning of maths is fundamental to the problem solving skills of engineers in every sector and most especially in the 'new technology' sectors of ICT, energy, pharma and biomedical engineering - the very sectors that are driving our export led growth and likely to dominate our economic recovery in terms of innovation and enterprise into the immediate and near term future.

6. ENGINEERING EDUCATION

With regard to engineering education at third level there is increasing recognition of new market sectors in many of these growth areas in terms of Masters level 9 degrees. In my view though, the whole undergraduate area requires closer examination as I do not detect a full recognition of the changing market outlook. I speak as an employer of graduates who has had to go away from the traditional engineering courses to find graduates skilled in waste management, energy and environmental engineering at undergraduate. Indeed increasingly environmental scientists are occupying these roles and are complementing the civil, mechanical and electrical engineering skills which we already have.

One has to ask why the new growth areas are not better catered for at undergraduate level? I have researched national policy in this area and it appears that Ireland's third level engineering schools are autonomous in the area of deciding what courses to run to meet market requirements. There is an overarching Strategic Plan (2008 - 2010) from the Higher Education Authority and a National Strategy for Higher Education to 2030 published in January 2011. This latter document confirms that colleges are autonomous but it also calls for more 'collaborative outward looking' arrangements with other colleges in terms of learning outcomes.

In our tour of universities and research institutes I am heartened to see that most colleges have now appointed Vice Presidents for research and/or innovation or in fact both.

To date we have been in the new NUIG Engineering School and Research Institutes, in the new UCD Science Centre (Phase I) last week and in the DCU Research Institutes. The extent of innovation and discovery in these new centres is truly remarkable involving in all cases a coming together of science, engineering and technology and very often medicine also. Most impressive of all are the advances in biomedical engineering, assisted living, digital technology and computational sciences. Research collaboration appears to be increasingly embedding in the third and fourth level college communities and that is very welcome.

It is critical in my view that all third level engineering colleges are capable of a high level vision for innovation and enterprise to meet the demands of the future economy. In this regard there is increasing evidence of integration of skills across the various engineering disciplines where civil, mechanical, electrical, electronic, chemical and environmental skills combine to solve increasingly complex problems and even some involving schools of business, social science and public policy.

Might I also say that the physical integration of engineering sectors in the one building is also important too as all disciplines now need to work more closely together to solve the increasingly complex problems that demand a solution. In the past, too often the masterplanning of third level colleges have regulated the engineering disciplines to "the far end of campus" in favour of other disciplines. That is no longer acceptable in Transformation Ireland. Indeed it is now more clearly recognised that engineering is the key driver to economic growth and at university level is the primary 'seed capital' to drive new innovation and job creation.

There are also increasing efforts in terms of third level colleges to become part of strategic alliances as has occurred in recent years by UCD/Trinity and NUIG/UL often together with industry partners and sometimes also with clinical partners in the case of bioscience and biomedicine.





In the meantime, we in Engineers Ireland have to continue in making any improvements we can through the STEPS programme to make the STEM subjects – science, technology, engineering & mathematics – more relevant to school leavers and to assist the better training of teachers. Our free maths grinds on Saturdays during school year will continue and have extended this year to junior certificate level. In terms of upskilling and CPD for engineers there is an increasing role for distance learning. I had the pleasure recently of launching the new Masters in Sustainable Development in DCU through Oscail – their open learning school. This Masters course uniquely has modules of water, waste, energy and procurement - all very relevant subjects to engineering currently.

7. PLANNING AND DEVELOPMENT

I now want to turn my attention to the translation of engineering knowledge to the development of projects in Ireland. I have been involved in the planning, engineering, environmental design and appraisal of these projects for over 30 years firstly in waste/wastewater, then in energy, then in roads and finally in waste management over the past decade or more.

The planning system in Ireland has evolved since the early 1960s and is now reasonably robust. In particular the new Planning and Development Act 2000 consolidated our planning laws and was strengthened by the Strategic Infrastructure legislation in 2006. An Bord Pleanála has functioned well and efficiently in recent years on landbased developments and particularly well on strategic infrastructure projects. There is now an urgent need to provide a similar statutory framework for all marine based projects to assist the development of offshore renewables and other marine development.

There are two amendments that I would suggest to landbased developments to further consolidate our statutory consent process - to also transfer ancillary powers to An Bord Pleanála with respect to Foreshore Licences and Commission for Energy Regulation licences to generate energy in the case of water, waste and energy projects to give a 'single consent process'. A similar recommendation has been made by the Irish Academy of Engineering. Secondly, there needs to be more formal and active arrangements for 'community engagement'. The reason for this is simple and it boils down to three simple words – People Stop Projects. The current 'public consultation' process is not 'community engagement' as the public are only consulted when planning permission including the Environmental Impact Statement is lodged and all the strategic decisions are made. The mandatory requirements for Strategic Environmental Assessment at feasibility report stage are helpful but the public rarely engage with this process as frankly they don't understand it.

Infrastructural projects need to be part of a 'strategic planning framework' which involves sufficient measure of community engagement to get public 'buy-in' to necessary projects at pre-implementation stage.

In addition modern building and infrastructural developments in Ireland now need to be 'plan led' not 'developer led' unless underpinned by the City/County Development Plans or Local Area Plans.

We all know from the current property crisis where "soft touch regulation" has brought us in terms of "developer led" proposals, which have little or no strategic underpinning in spatial planning terms. In addition, in terms of planning and environmental policy, planning decisions made either by An Bord Pleanála under the Strategic Infrastructure Act or on Appeal need to be respected as meeting a national or strategic need regardless of any NIMBY or local considerations.

In terms of site selection for projects, there is always "the Why", "the How" and "the Where". In terms of public engagement, it is always better in my view to get some measure of consensus on project need (the "why") and preferably the development implementation method (the "how") before consulting the public on the location (the "where"), as often objections to site or route selection are needlessly based on a questioning of project need and methodology, as much as on site location.



8. PUBLIC PERCEPTION OF ENGINEERS

The general public who are the ultimate client for our goods and services are sensible enough to discern the "common good". If there is misinformation or disinformation from opposition groups this needs correction in the media. It also needs sufficient political maturity based on a strong mandate which it has to be said the current Government now have and are clearly exercising in the public interest, particularly in the whole planning, environment and local government area and in other areas also. I have much experience of these projects myself over the past 20 years and have seen the benefit of a proactive community engagement from the start and the legacy problems that can ensue where this is lacking.

That brings me back to where I started – what is an 'engineer' and how is he or she perceived in society. In any communications effort we must be aware that the public are less interested in 'process' and more in 'outcome'. The public are not really interested generally in the diameter or pressure of a pipeline delivering water or gas but do want 'clean drinkable water' and 'safe gas to cook the vegetables or to heat the house'. To portray our profession accurately therefore, we

need to profile our role models as the people who serve the legitimate public interest by keeping traffic moving, who design our power stations and wind farms, supervise biomedical operations in hospitals and maintain our broadband to feed our social media and mass communications. I think that the profession does not give itself enough credit for work that is generally done in the public interest and in a trustworthy ethical fashion for which other professions are often respected.



9. LEADING NATIONAL RECOVERY

In my inaugural address I spoke of engineers leading national recovery through a clear policy basis in areas such as transport, energy, water, waste and communications. I also spoke of the need for engineers to integrate their technical response to engineering projects by having regard not only to the 'technical facts and figures' but to factor in environmental, social and political considerations. In this way we are likely to have a constructive public conversation on the project.

If our response to a traffic problem is necessarily to build a new road rather than traffic calm or to a water shortage is solely to seek a new source rather than fix the leaks or conserve water or rely solely on fossil fuels to solve our energy problems then we are unlikely to develop a sustainable future or communicate well with the general public. Very often technically we may actually be correct in offering purely technical solutions but there's more to life than technical solutions! As for instance, if we ignore the need for a 'low carbon infrastructure' because of climate change considerations and say that our electricity interconnectors don't make economic sense to assist renewable energy, then we might satisfy some objectors to proposed overhead power lines but we won't have credibility to lead our national infrastructure efforts, we will not be able to have a real influence in policy and we certainly won't inspire!

We have to integrate our great talents with the other professions to have a holistic approach to policy drivers in terms of creating new products and services while meeting the global challenges of climate change, market volatility and competitiveness. We also need to internationalise ourselves with cultural diversity and language skills.

We now live in a world where technology has made it possible for companies to take their business anywhere. We have to change the way we do business to be export led to compete in dynamic highly globalised markets abroad while maintaining and growing our innovation ecosystem at home. To help competitiveness we need to market our unique skills of education, innovation and enterprise to give added value to our customer. In times of recession there is little point in cursing the darkness but let's find a new candle that will lead us forward. As engineers, let's shine a stronger light on our efforts to support sustainable living.

We need to help our development agencies build the 'Transformation Ireland' that will continue to attract inward investment but will also allow us to export our value added knowledge services increasingly to foreign markets. In terms

of recovering our economy it has to be that 'twin track' approach. As the authentic and elected voice of engineering in Ireland let us lead our enterprise forward. This land is our land, this land is your land and we are proud of what we can do. We need to show the Irish people more clearly what engineers can do and will do to help build a sustainable future across all of our sectors. We hope to engage with the Irish public later this autumn in what 'Chartered Engineers' can do and indeed are currently doing in the Irish economy.

Is mór an onóir domsa bheith anseo anocht agus an díospóireacht éigsúil seo a chur as bhur chionn. Tá duslán mór ann. Táimid reidh an duslán a glacadh agus tarraing siar an obair riachtaineach seo ar son an náisúin. Tá Cumann Innealtóirí na hÉireann brodúil as bheith pairteach san saol eacnamaíochta na tíre agus ár gcorp a chur chuig an iarann.

Tonight I want to salute the engineers of Ireland. In poor economic conditions when you wish you could have more resources than you have - you continue to maintain our water supplies, our power supplies, our hospitals our pharma plants, our food processing, our national communications and to keep traffic moving on our streets. If we all work together as a profession and more closely with other professions some of whom are here tonight or who may be listening to me on podcast wherever you are, at home or around the world, then I'm confident that we will together build a new and sustainable Ireland.

PJ Rudden
Chartered Engineer, FIEI
President, Engineers Ireland
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Engineers Ireland
22 Clyde Road
Ballsbridge
Dublin 4

Tel: +353 1 665 1300
www.engineersireland.ie