Bridging the talent gap
Engineering a new work force for the U.S. steel industry

Introduction
The U.S. steel industry, marked by restructuring and static capacity, is at a critical point. After more than a century of historic global leadership in manufactured goods production, U.S. domestic manufacturing overall has faced challenges, in share of gross domestic product and employment.1 Broadly, the global manufacturing industry has seen an uneven recovery from the financial crisis of the last decade, with overcapacity persisting worldwide and supplies of raw materials remaining subject to price volatility.2 The American steel industry, in particular, must effect double-digit growth (23 percent) to maintain only a single-digit share (6 percent) of the total global steel market by 2025, while rest-of-world producers stand to continue to claim the majority proportion.3

But the steel sector has long been a resilient pillar in U.S. manufacturing, and there are reasons for optimism. The industry makes far-reaching contributions to the economy with pervasive multiplier effects.4 Production across manufacturing sectors has remained well above the massive drop of 2008 levels.5 Global megatrends point to new, disruptive opportunities for innovation-driven solutions (services and products).6 And the recent availability of affordable shale-derived energy may renew the competitiveness of U.S. manufacturers.7

Manufacturing in the U.S., impelled by government initiative and pulled by new market opportunities, is embracing innovation. Dated perceptions of “blue collar” jobs by the American public do not adequately reflect recent developments in manufacturing8 — a market of many industries that contribute massively to the broader economy and employ substantial numbers, in direct and indirect jobs; are committed to ever-higher safety standards; are demonstrating clear productivity increases; and are actively seeking innovative leadership in new workforce recruits for both blue collar and white collar positions.

This communiqué highlights the need for concerted industry effort to attract, train, and retain a new skilled workforce, as a pivotal factor in reinvigorating the domestic steel industry. Even the most favorable market conditions will falter without a revitalized labor force of specialized, skilled talent to perform and innovate, in both traditional and advanced manufacturing, in both blue collar and white collar jobs.

The U.S. federal government has acknowledged the importance of refortified manufacturing sectors to the national economy — importantly, through securing a talent pipeline (in addition to policies and regulations for a favorable business climate, and support of innovation).9 The government’s ability to effect these, however, may be hampered by mounting debt and other national priorities that limit spending.10 Some initiatives are proceeding, regardless, such as the Obama Administration’s recent call for a National Network for Manufacturing Innovation,11 including a request to Congress for a one-time US$1 billion
Manufacturing skills gap

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Number of companies who view a moderate to serious shortage of skilled production workers in the U.S.</th>
<th>Number of companies that expect this shortage in the U.S. to worsen over the next three to five years</th>
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<tbody>
<tr>
<td>83%</td>
<td>3 million</td>
<td>69%</td>
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* Skilled production workers include machinists, operators, craft workers, distributors, and technicians


investment to create a system of public-private partnership hubs (“Institutes of Manufacturing Innovation”).

The imperative is on the U.S. steel industry to address the current skills gap on its own behalf — and for benefit of the broader American economy — with a coordinated collective effort to revitalize its human capital. Doing so may not only help the industry reclaim a global market share but, through innovation, usher in entirely new possibilities for generating value.

Steel industry: where we are now
It is true that indicators of recovery in the global steel industry remain uneven. Regional overcapacities persist, and continued massive demand for steel in China may correlate with raw material supply pressures and price volatility worldwide for some time. In the US, particularly, overcapacity, underutilization, and violations of international trade laws by certain nations challenge the industry’s effective recovery.

However, despite these challenges, the combined global iron and steel markets recently shifted from a state of decelerating decline, to accelerating growth; and although overall growth was flat in recent years (and in the U.S., may continue to be so for some time), demand in developing economies is increasing, which U.S.-based companies may potentially capitalize on.

The irony of the talent gap
It is against this complex backdrop of halting but optimistic growth that the U.S. steel industry faces a pressing lack of qualified workers. For some years, American manufacturers have reported a significant shortage of the skilled talent needed to support business growth, with as many as 600,000 manufacturing jobs unfilled.

A skills-gap survey by Deloitte United States (Deloitte Development LLC) and The Manufacturing Institute saw 83 percent of manufacturing companies citing a moderate to critical shortage of skilled production workers — a shortage expected only to heighten over time. Other industry estimates concur, with surveyed manufacturers reporting moderate to severe shortages of skilled labor (75 percent) and highly skilled labor (over 80 percent). Predictions are that the shortfall of U.S. skilled factory workers could increase to 3 million by 2015. Increased production costs and losses of revenue due to this shortfall in human capital could cost US manufacturers up to 11 percent in lost revenues.

Public attitudes may explain this skills gap, at least in part. In a separate survey, Unwavering commitment: The public’s view of the manufacturing industry today, also sponsored by Deloitte United States (Deloitte Development LLC) and The Manufacturing Institute, manufacturing ranked fifth among seven key industries as a career choice for the American public (the other industries: technology, energy, health care, communications, financial services, and retail).
U.S. Public perception of manufacturing jobs

- 78% Think manufacturing jobs as the first to be subjected to overseas outsourcing
- 50% View manufacturing working environments to be safe and clean
- 37% Perceive manufacturing jobs as stable compared to other industries
- Less than 10 percent of the U.S. workforce is currently employed in manufacturing, down from 14% in 2000 and 30% in 1960


The U.S. manufacturing workforce has declined as a percentage of total employed, from 30% in 1960 to less than 10% currently. The apparent devaluing of trade jobs by Americans is evident enough throughout the global steel industry to have been cited by international executives as a potential competitive advantage for their own manufacturing sectors, particularly in nations whose populations take pride in employment in the manufacturing trade.

However, unlike industries, the lesser interest in manufacturing jobs makes some sense given that the majority of the public (78 percent) perceive manufacturing jobs as the first to be subjected to overseas outsourcing; only 50 percent believe the working environment to be safe and clean; and less than half (37 percent) view manufacturing jobs as stable compared to other industries.

These public perceptions inadequately reflect actualities of the current steel and manufacturing industries. It is true that unemployment for blue collar jobs has exceeded that for service industry and white collar sectors over the last four decades; however, in the last few years, blue collar unemployment has fallen (from 15.3 percent in February 2010 to 7 percent in April 2014), which may highlight increasing job security in the sector.

Further, the industry’s safety record is strong: lost time to injuries decreased 72 percent from 2004 to 2012, and initiatives to continually augment safety records are spearheaded by the industry itself.

The talent gap for manufacturing becomes puzzling when considering certain job-market realities for recent U.S. college graduates. Reduced federal funding for, and increasing costs of, university education have contributed to total outstanding student loans of US$1.08 trillion — 11.5 percent of which are either delinquent by 90 days or more, or in default. Average student debt increased more than US$10,000 within seven years (from US$17,233 in 2005, to US$27,253 in 2012), with tuition and college fees over the past decade growing faster than median household income. Meanwhile, tuition at top-ranked graduate schools in materials engineering is as high as US$29,000 to $46,000 per year.

Student debt in the U.S.

- U.S. total outstanding student loan balance
  - 11.5% of student debt is 90+ days delinquent or in default: Highest among all loan types
  - $29,000 to $46,000 per year: Average tuition for top-ranked graduate schools in materials engineering

Blue vs. white collar jobs

Number of U.S. workers

<table>
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<tr>
<th>White collar workers</th>
<th>56.2 million</th>
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<tbody>
<tr>
<td>Blue collar workers</td>
<td>87.3 million</td>
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Unemployment

- **9.6%** Unemployment rate for less than high school diploma
- **6.3%** Unemployment rate for high school graduates
- **3.4%** Unemployment rate for bachelor’s degree and higher


Unemployment conditions would seem to place additional pressure on graduates to be more flexible regarding industries deemed desirable in which to seek work. Although U.S. unemployment rates drop from 9.6 percent for those with less than high school diplomas, to 6.3 percent for high school graduates, to 3.4 percent for those matriculating with bachelor’s degrees or higher; the debt load associated with college degrees may discourage graduates from pursuing higher education.

Intuitively, this might seem both to support a “blue collar” work force of those without college degrees, as well as encourage college graduates to seek jobs in whatever industries have decent-paying positions available to alleviate student loan burdens. After all, steel workers may earn annual wages up to US$85,660 (90th percentile), from a mean salary of US$51,590 — pay scales that compare favorably with those of other blue collar jobs (e.g., construction, with a mean yearly salary of US$50,908) and of white collar jobs (information technology, average salary of US$54,232, and financial activities, US$46,761). And although blue collar jobs outnumber white collar jobs in the U.S. (87.3 million to 56.2 million), regardless, a labor shortage of qualified workers remains — confounding in light of the plain fact that there are jobs to be filled that pay well and offer the potential for job satisfaction and to create impactful innovations, during a time of high unemployment and oppressive student-loan debt. Meanwhile, to reiterate an essential statistic, 600,000 manufacturing jobs go unfilled.

Cultivating new talent pools

There are some indications that, as an initial step, public-awareness campaigns by the industry could be fruitful. Despite the labor shortage, only 26 percent of the U.S. population think manufacturing jobs are available and accessible; and the notion that manufacturing jobs aren’t secure, during a time of actual talent demand, is likely attributable to lack of awareness.

Overall, the U.S. population favors the manufacturing industry — valuing its importance to standard of living, economic prosperity, and national security, but also in providing careers for well-educated, highly skilled individuals (according to 66 percent of respondents) in jobs that are interesting and rewarding (59 percent). This would seem to counter the existing talent gap. But it is highly telling that among 18- to 24-year-olds — the age group comprising university students and recent graduates facing career choices — only 39 percent consider manufacturing careers to be meaningful, compared to 59 percent of total-population respondents.
An approach to solving the talent gap at root cause, versus with “symptom treatments,” would directly address education, ideally of students yet in formative years — certainly to influence decisions about career choices after college graduation, but importantly, decisions also about whether to attend college at all, versus pursuing trade-school education and apprenticeships.

Americans value higher education. Enrollment in undergraduate programs increased from 12.5 million to 18.3 million in the decade and a half ending in 2011 (though this value plunged by almost half a million between 2011 and 2012); the largest increases, however, coincided with periods of sharp economic downturn (from 2000–02 and 2008–10), hinting at least that students may opt for college education when hiring markets are tight. There is an obvious illogic to this, given the average student loan debt of over US$27,000.  

For the steel industry, the opportunity exists to strategically target younger students in the formative pre-college years. A recent downturn in number of college enrollees may be expanding a population inherently more receptive to recruitment by the manufacturing sectors. Early exposure to job-market realities (student debt, general unemployment statistics, job availability, and the need for highly skilled, innovative minds) may duly influence youth unsure about pursuing baccalaureate status. This could encourage youth to find manufacturing jobs instead of seeking university education simply due to lack of exposure to other meaningful choices.

Industry efforts to concertedly foster, over time, a new generation of innovative workers in both blue collar (operations) and white collar (engineering and technical management) positions could continue through high school and beyond. Skills development through technical and vocational programs and certification programs might be developed in partnership with community colleges and relevant universities, government, and trade organizations (examples presented below).

Regarding those who do pursue university education, the manufacturing industry might do well to target specific, emerging concerns of the college-aged and recently graduated, which seem increasingly to align with preferences of the overall workforce. In face of the massive student-loan debt and employment noted above, millennials nonetheless have specific demands for job satisfaction — standards they appear unwilling to relinquish. For instance, innovative work environments are highly valued, as is the opportunity to effect positive change for society beyond “mere” financial performance.

These standards translate to expectations of employers. Millennials believe that businesses generally fall short of their potential to innovate, that they provide unsatisfactory opportunity for professional development, and insufficiently contribute back to society. Likewise, the non-negotiable demand for meaningful work pervades the overall population of currently employed: a majority of those who leave their current positions take jobs that promise greater challenges, more use of their abilities, and greater potential for career advancement.

Returning veterans represent a largely to-date untapped potential workforce whose experience may translate well to the manufacturing sectors. Indeed, initiatives such as the “Get Skills to Work Coalition” by General Electric, Boeing, Lockheed Martin, Alcoa Inc., and The Manufacturing Institute expressly aim to reengage returning vets in meaningful work, through mentoring and recruitment to the manufacturing sectors (discussed below).
U.S. falling behind on talent

Percentage of bachelor’s degrees awarded worldwide in science and engineering fields in 2010

<table>
<thead>
<tr>
<th>Country</th>
<th>Science</th>
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<tbody>
<tr>
<td>U.S.</td>
<td>10%</td>
</tr>
<tr>
<td>Europe</td>
<td>17%</td>
</tr>
<tr>
<td>China</td>
<td>25%</td>
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29 The number of industrialized nations whose high school students performed better than U.S. students in math in 2012

22 The number of industrialized nations whose high school students performed better than U.S. students in science in 2012

For the steel industry to expand its worker base will be a complex undertaking at the intersection of opportunity and challenge. Certain issues must be addressed if U.S. manufacturing industries are to boldly regain competitiveness through growth of human capital:

- Untapped and limited talent pools
  - The overall pool of potential engineering talent could be expanded. In 2010, over 5.5 million first-time university degrees were awarded in science and engineering worldwide — but the United States lags (10 percent of total) behind China (25 percent) and the EU (17 percent); within the U.S., only 5 percent of degrees in 2010 were in engineering, compared with 31 percent in China. This lag has its roots in gaps, in turn, at the high school level: 29 industrialized nations have high school populations that surpass that of the U.S. in math performance, and 22 industrialized nations show stronger high school performance in science.

- Women are yet sharply underrepresented, constituting only 25 percent of the labor force in the U.S. manufacture of durable goods.

- Inadequate training programs
  - Professional and skills-development programs in the U.S. are scope-limited and fragmented in comparison to those of other nations with well-established training systems. German vocational programs, for example, support learning through training-and-education apprenticeships lasting 2 to 3.5 years, wherein apprentices devote 3 to 4 days within a company for practical training and 1 to 2 days at vocational school for didactic study; they further receive monthly training allowances averaging €650 (US$899). In 2010, over 1.5 million Germans completed such training (compared to 0.5 million U.S. apprentices in domestic programs), significantly, with roughly equal numbers of male and female graduates, and up to 61 percent choosing to remain in their apprenticeship companies upon program completion.

Commitment to meeting these challenges could better leverage existing potential talent pools and open non-traditional ones, to harness the vision, passion, and capacities of these populations towards innovative solutions of national importance.

Leveraging the talent-gap challenge

Deloitte United States (Deloitte Development LLC) and The Manufacturing Institute previously determined that the manufacturing industry anticipates the talent gap to disproportionately impact skilled production jobs. Up to 80 percent of surveyed industry respondents expect machinist, operator, craft worker, distributor, and technician positions to be most affected by upcoming retirements44 — that is, production jobs that require the most training and have the greatest impact on operations.

The threat of the talent gap is not new. Long-term workforce planning has been a priority for manufacturing business leaders for some years.55 The fact that the talent crunch seems not to be alleviating suggests the need of creative approaches to strengthening the U.S. steel industry’s human capital base.

Analytics will do much towards identifying meaningful recruitment actions and business decisions. Companies are pointed to emulate the competitiveness maps of high-performing manufacturers56 and to develop proven recruitment and retention through implementation, monitoring, and assessment.

Specific tactics within a strategic framework could include:

- Emulating innovative training and mentoring initiatives (e.g., Toyota’s decision to replace automation, by reintroducing humans in segments of certain production lines,57 discussed below)
- Actively introducing youth to practical industry experience, for instance, through summer employment and internship programs
- Retraining existing workers in new innovation platforms (technical and management innovations)
- Collaborations with technical colleges to expand transferable skills-certification programs
- Investment into and strengthening of apprenticeship programs

In pursuing such strategic actions, the industry could look to partnerships and initiatives like the following:

- Ferrous Metallurgy Education Today (FeMET), created by the American Iron and Steel Institute and the Association for Iron and Steel Technology (AIST) Foundation, encourages students to select metallurgy and materials sciences as academic majors. FeMET also offers competitive grants to university professors to update and enhance industry-relevant curriculum in ferrous metallurgy programs.58 College scholarships and program grants from AIST total over US$600,000 per year.59
- Founded by General Electric, Boeing, Lockheed Martin, Alcoa Inc., and The Manufacturing Institute, the “Get Skills to Work” coalition trains military veterans for jobs in advanced manufacturing, including translating industry-relevant military skills. The collaboration, which aims to reach 100,000 veterans by 2015, also works with employers to support recruitment and mentoring of veterans.60 The coalition comprises small, medium, and large-sized manufacturers, along with academic and not-for-profit partners, currently including the U.S. Department of Veterans Affairs Center for Innovation, Linked In, the Institute for Veterans and Military Families at Syracuse University, Gary Sinise Foundation, Acreum, and Cincinnati State University.61
- The Skills Certification System, launched by The Manufacturing Institute, is a credentialing initiative for nationally portable, industry-recognized validation of theoretical and practical knowledge for manufacturing industry jobs. The Manufacturing Institute partnered with several industry skills-certification programs to create a system of “stackable” credentials that can be awarded in post-secondary education.62 The system currently includes certifications for foundation skills, cross-cutting technical skills, machining and metalworking, welding, automation, construction, die casting, fabrication, fluid power, lean, mechatronics, quality, transportation, distribution, and logistics, technology, and engineering.63
- United Auto Workers, in partnership with Ford, General Motors, Chrysler, John Deere, and suppliers American Axle, International Automotive Components, Gerdau Special Steel, Tower Automotive, and others, plans to add around 2,000 apprentices in 2015, with starting annual wages between US$40,000 and US$60,000.64
- As part of the Advanced Manufacturing Partnership, which teams government, industry, and academia to promote U.S. manufacturing leadership, President Obama launched the Advanced Manufacturing Partnership Steering Committee “2.0.” The Committee
U.S. steel industry

152,900

Number of people in the United States employed in the steel industry

Multiplier effect — each job in the steel industry directly and indirectly supports seven jobs in the broader U.S. economy

2

Average man-hours per ton of steel produced, making U.S. steel industry among top-tier in terms of labor productivity


is part of a continuing focus to maintain domestic leadership in emerging technologies that create manufacturing jobs. The Committee aims to sustain U.S. investments in science, technology, and innovation, establish a National Network of Manufacturing Innovation Institutes, upgrade community college workforce training programs, and deploy returning veterans in skilled manufacturing jobs.

It is an opportune time for the U.S. steel industry to identify possibilities for and create such partnerships as above, given the current Administration’s demonstrated interest in advanced manufacturing. The April 2014 announcement by the President, of federal grants of US$500 million to support job-driven training, will expand training partnerships with industry, businesses, unions, community colleges, and training organizations. Grantees must identify sectors with job gaps, partner with the public workforce and employers to address necessary skill sets for these jobs, and create paths for new recruits to progress from entry-level to more-advanced positions.

The U.S. Department of Labor has allocated US$100 million for American Apprenticeship Grants to reward partnerships that increase the domestic apprentice population. The grants, to launch in fall 2014, will support collaborations between employers, labor organizations, training providers, community colleges, local and state governments, the workforce system, non-profits, and faith-based organizations.

Lighting a fire: pushing the inflection point

These programs come at a time when U.S. apprenticeships have been declining (at a CAGR of 4.3 percent from 2002 to 2013), and the number of active programs, waning steadily: although new apprentice enrollments increased slightly from 2008 to 2013 (from 112,582 to 113,745), these numbers remain well below the highs observed in 2006 and 2007 (188,006 and 192,128, respectively).

To overcome the talent gap will be a complex undertaking, but the imperative is there. The importance of the U.S. steel industry cannot be overlooked and instead could be highlighted to policymakers and the public alike. The strength of the sector should not be underestimated. Labor productivity has seen a fivefold increase since the 1980s (in 2013, an average of 2.0 worker-hours per ton of finished steel, from 10.1 man-hours). Such achievements rest on the contributions of a highly skilled workforce implementing industry-wide innovations.

A healthy steel industry is crucial to the U.S. economy, given significant multiplier effects in several economic indicators:

- Every US$1 increase in sales of iron and steel and ferroalloys adds US$2.66 to the broader economy.
- The steel sector generated an estimated US$22.9 billion in local, state, and federal taxes in 2011 alone.
- The industry purchases as much as US$20 billion of materials from other industries, US$8 billion of services, US$5 billion of energy products, and over US$4 billion in transportation services annually.
- Each job in the steel industry directly and indirectly supports 7 jobs in the broader economy (in gross numbers, a total of over 1 million jobs in 2011).
Still, career choices are in the end highly personal. Encouraging pursuit of jobs in manufacturing sectors may require adroitly leveraged marketing communications about the current growth drivers for the U.S. steel industry. The potential therein is to address the key demands of newer cohorts of job candidates:

• **Societal contribution**: Maintenance of the country’s highways and bridges, alone, represents a multibillion-dollar opportunity for the industry: the U.S. Federal Highway Administration estimates US$20 billion needed over the next fifteen years to sufficiently update existing bridges — exceeding 60 percent of current expenditures.\(^7^5\)

• **Innovation**: U.S.-driven developments of new steel grades can reduce vehicle weight by up to 36 percent, in turn reducing CO\(_2\) emissions from transport vehicles by as much as 156 million metric tons annually.\(^7^6\) Other truly innovative opportunities, such as afforded by an Advanced Materials Systems (AMS) approach, could be game-changing disruptors of current markets, through creative solutions to problems posed by key global megatrends (including explosive population growth and urbanization, especially in developing economies, and increasing resource shortages).\(^7^7\) And because AMS and similar approaches incorporate new business models (e.g., cultivating collaborations with nontraditional partners further upstream or downstream in one’s value chain), new talent may have ample opportunities to evolve their careers to implement innovations in organizational culture and operations as well as in technology — that is, the old view of “blue collar” jobs as repetitive, mindless work no longer holds true for today’s manufacturing industry.

Toyota, for example, is counterintuitively increasing human involvement in roboticized production at its Honsha, Japan, facility,\(^7^8\) concertedly prioritizing quality and efficiency over growth in a three-year freeze on new auto plants. The decision has resulted in employee-identified innovations such as reductions in scrap levels, eliminating about 10 percent of material-related waste from building crankshafts. Inherent to this initiative is the cultivation of traditional mentoring that respects the practical operational knowledge gleaned by senior employees. This is the kind of workplace creativity that new recruits to the U.S. steel industry might spearhead, increasing their own sense of job satisfaction as well as measurably contributing to industry growth.

• **Leadership and professional advancement**:
  Manufacturing has evolved in the past two decades to include team-based operations, global and inter-location mobility programs, and special projects, each of which calls for new leadership skills beyond what were required in previous-generation manufacturing jobs.

Furthermore, mass retirements in the industry will create a workforce bottom-heavy with newer entrants. This in turn might catalyze demand for leaders to “rise within” companies; line-production jobs might readily translate to management positions for employees who apply self-initiative to a deep understanding of operations in response to emerging market needs.
Industry competitiveness
Factors influencing global competitiveness of the U.S. steel industry

Skilled workforce Availability of quality raw materials Access to cost-effective energy Evolving government policy and regulations Competitive tax policy applied within simplified tax systems


The bigger picture: long-term competitiveness
The U.S. Office of Science and Technology Policy acknowledges a threefold basis for the country to regain a competitive manufacturing position — cultivating and attracting high-skilled talent, incentivizing tax and business policies, and supporting basic research and innovation.29 A pointed industry effort for a revivified U.S. steel sector would strategically address the talent gap with a concerted push at this current time — while developing markets like Mexico, Turkey, Brazil, Thailand, Indonesia, India, and Vietnam are yet ramping up growth and while China moves into a slower growth phase.30

However much the talent gap may be most critical over the medium term, ultimately all competitiveness variables will come into play, including:
- Access to quality raw materials (iron ore, coking coal, freight, and scrap)
- Access to cost-effective energy
- Evolving government policy and regulations (some of which, without industry influence otherwise, may hinder the steel sector’s competitiveness)
- Continued high corporate tax rates in the U.S. coupled with pension burdens on companies

Optimistic horizon
Overall, despite ongoing challenges to various markets worldwide, there are reasons for optimism in the U.S. steel industry. Manufacturing companies are shifting production back to the country,31 thereby making a strengthened U.S. manufacturing workforce of interest to non-American steel companies as well domestic ones. Furthermore, global megatrends, including increased urbanization and population growth,32 could feed infrastructure demand for some time. Meanwhile, the influx of natural gas from shale reserves in the U.S. may open availability of direct reduced iron, in turn also driving down scrap prices.33 All this is during a period of advantageous natural gas supply that the U.S. may enjoy for several decades over other countries, which are ramping up extraction of their own shale reserves but yet lag behind the U.S. in the technological and business expertise demanded by unconventional feedstocks.34

The U.S. steel industry is at an exciting juncture, and to the degree that it tackles the challenges faced, may poise itself for renewed leadership in the global market. Ultimately, the onus is on the industry itself to inform needed policy and to create the public-awareness and education and training initiatives to entice and retain new skilled recruits. The challenge and opportunity is to highlight the fact that the current-day manufacturing sectors indeed offer financially rewarding careers in safe workplaces that call upon more problem-solving intelligence and innovation capability than the public seems to perceive — in short, that the “blue collar” jobs of yesterday are not the blue collar jobs of today. For a strong U.S. steel industry — one equipped to continue its significant contributions to American and international economies — there may never be a better time for American steel manufacturers to rethink approaches to human capital.
Endnotes

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81 President’s Office of Council of Advisors on Science and Technology, Executive Office of the President, Report to the President on ensuring American leadership in advanced manufacturing, June 2011.


84 Observation by the DTTL Global Manufacturing Industry group.
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